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14. ABSTRACT The intent of this project was to integrate whole exome genetic and global expression data to identify genes that contribute to the formation, progression and heterogeneity of NF2-associated tumors. We first prepared and submitted for exome sequencing 126 samples representing paired human tumor (meningioma or schwannoma) and normal DNAs from the same individuals. We also prepared RNA from the same tumors for transcriptome sequencing. We then complemented these datasets with RNA expression data from of a panel of isogenic arachnoidal cell lines either heterozygous or homozygous for inactivating <i>NF2</i> mutation to define the primary effects of merlin loss in this cell type, which gives rise to meningiomas. Our analyses indicate that secondary mutations in meningiomas occur primarily as large chromosomal structural variations rather than point mutations, in contrast with schwannomas where tentative second-hit somatic alteration of particular genes was noted. Our expression studies also implicate several genes as potential targets for therapeutic approaches for meningioma.					
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Introduction

In neurofibromatosis 2 (NF2), tumor formation requires inheritance of a germline mutation in the *NF2* gene that inactivates one allelic dose of the merlin tumor suppressor, followed by somatic loss or inactivation of the remaining allele. However, it is not known whether merlin deficiency alone is sufficient for tumor formation, either in schwannomas or in meningiomas, the two major tumor types of NF2. A number of lines of evidence suggest that other genetic lesions may participate in the initiation of NF2 tumors and that other genes certainly contribute to the functional heterogeneity and progression observed in meningiomas. In the latter instance, there are many studies that have noted rearrangements of particular chromosomal regions in merlin-deficient meningiomas, but despite many years of investigation of these regions, the critical genes that participate in tumor development and heterogeneity and the biological pathways that they represent remain unknown. We postulated that there are somatic genetic events that occur in individual genes that contribute to the formation, progression and heterogeneity of tumors in NF2 and that integrated analysis of whole exome sequence data together with tumor characteristics, genomic rearrangements, and RNA expression data from these tumors in comparison with normal arachnoidal cells would reveal the biological pathways that underlie the development and functional heterogeneity of NF2 meningiomas.

Keywords

Neurofibromatosis 2, meningioma, schwannoma, exome, transcriptome, arachnoid, CRISPR

Overall Project Summary

Task 1- DNA sequence analysis of meningiomas

Our first specific aim was to perform paired whole exome sequencing of meningiomas and normal DNAs from the same individuals to identify *de novo*, somatic alterations, from point mutations and small insertion/deletions that affect protein structure to large regions of loss-of-heterozygosity (LOH). We also indicated the possibility of complementing these analyses of meningioma with similar analyses of the other NF2-associated tumor, schwannoma. The goal in Year 1 was to generate exome data from the first 30 of these meningiomas and their matching normal DNAs. We first successfully screened a large number of tumors and selected those for exome sequencing. We then generated high quality DNA from 26 meningiomas (4 sporadic and 22 NF2-associated) with matched blood DNA. We also augmented this analysis by preparing high quality DNA from 30 vestibular schwannomas (4 NF2 and 26 sporadic) all obtained through clinically-indicated surgery and their corresponding blood DNA. In addition, we prepared DNA from 8 meningiomas, 5 vestibular schwannomas, 4 nerve samples and 1 arachnoid sample from two independent NF2 autopsies. We then submitted DNA from 126 samples (63 tumor and normal DNA pairs) to the DNA Sequencing Facility for preparation of exome capture libraries, indexing and deep sequencing using Illumina HiSeq2500 DNA Analyzers. By running this larger than anticipated number of tumors in a single batch, we avoided the potential batch effects of splitting the analysis into two batches of ~60.

In Year 2, we received and analyzed the exome data from these tumors. The exome sequences were generated by Illumina 76 paired-end sequence reads at the Broad Institute Genome Analysis Platform. Sequence reads that were demultiplexed by Illumina's CASAVA software, were mapped to the human genome build 37 (hg19) through BWA v. 0.5.9 [1] with parameters `-q 5 -l 32 -k 2 -o 1`. The resulting alignments were further sorted, indexed and duplicates removed using the Picard Tools [<http://broadinstitute.github.io/picard/>]. Next, base quality score recalibration and local realignment around known indels were performed using GATK [2,3]. In this process, five meningioma and two schwannoma samples failed to pass the QC metrics and thus, they were removed from more detailed analysis.

Somatic variants were called applying muTect v.1.1.4 [4] with parameters `-min_qscore 20 -clipping_bias_pvalue_threshold 0.05` and Indelocator [<https://www.broadinstitute.org/cancer/cga/indelocator>] with a parameter `-ws 300` to blood-matched tumor pairs to identify single nucleotide variants and small indels respectively. Variants were identified only in the target exon intervals used in the exome capture sequencing. Next, identified variants with the respective read depths $\geq 8X$ and $\geq 14X$ in paired blood and tumor samples, and tumor fraction ≥ 0.1 were annotated using Oncotator v.1.3 [5] with the oncotator_v1_ds_Sept172014 database.

Additionally, alignability scores (≥ 0.8) based on alignability of 36mers [6] were applied to further filter the variants.

For defining candidate genes whose inactivation contributes to tumorigenesis, we identified all *de novo* somatic variants in the exome data and classified them into loss-of-function mutations (nonsense, frame shift deletion and insertion, and splice_site), missense mutations with deleterious effect predicted by PolyPhen [7], Sift[8], Mutation Assessor [9], Mutation Taster[10] and LRT [11], and other non-synonymous mutations such as in_frame indels, and enforcing $\geq 10X$ coverage in blood samples. Overall, the raw calls from muTest and Indelicator indicated 1,481 *de novo* somatic sequence variants called in the exon and immediately adjacent intron regions in primary meningioma samples relative to the constitutional DNA from the same individual. Less than 10% of these were predicted to have a clear deleterious effect on the protein encoded by the corresponding gene (19 nonsense, 13 splice site, 56 frameshift, 2 start codon mutation). Among the schwannomas, 2,374 *de novo* sequence variants were called, including 22 nonsense mutations, 25 splice site, 66 frameshifts, and 20 in-frame indels. The variant-called reads were often present at significantly less than 50% of all reads, suggesting that there was mosaicism within some tumors. As expected, the *NF2* gene showed evident inactivating *de novo* somatic mutations with 4 nonsense changes in meningiomas and 3 nonsense, 8 frameshift and 5 splice site changes in schwannomas.

After filtering out sites where the total read count was < 10 , requiring stringent read quality scores and assessing missense mutations for their likelihood of having deleterious effects, a small subset of genes each appeared to display two independent somatic hits across these tumors, making these loci candidates for further analysis. These variants are shown in Table 1, with the gene name, function, location and size, accompanied by the specific nature of the sequence variation and what proportion of reads in the exome data revealed the alternate sequence. These genes were mutated primarily in schwannomas rather than in meningiomas, which, along with the difference in the frequency of dosage change (see below), suggested a somewhat different genetic architecture in these two tumor types, with the exception of chromosome 22 loss (the site of the *NF2* gene) which occurs at very high frequency in both.

Table 1- Candidate contributors to tumorigenesis based upon recurrent mutation

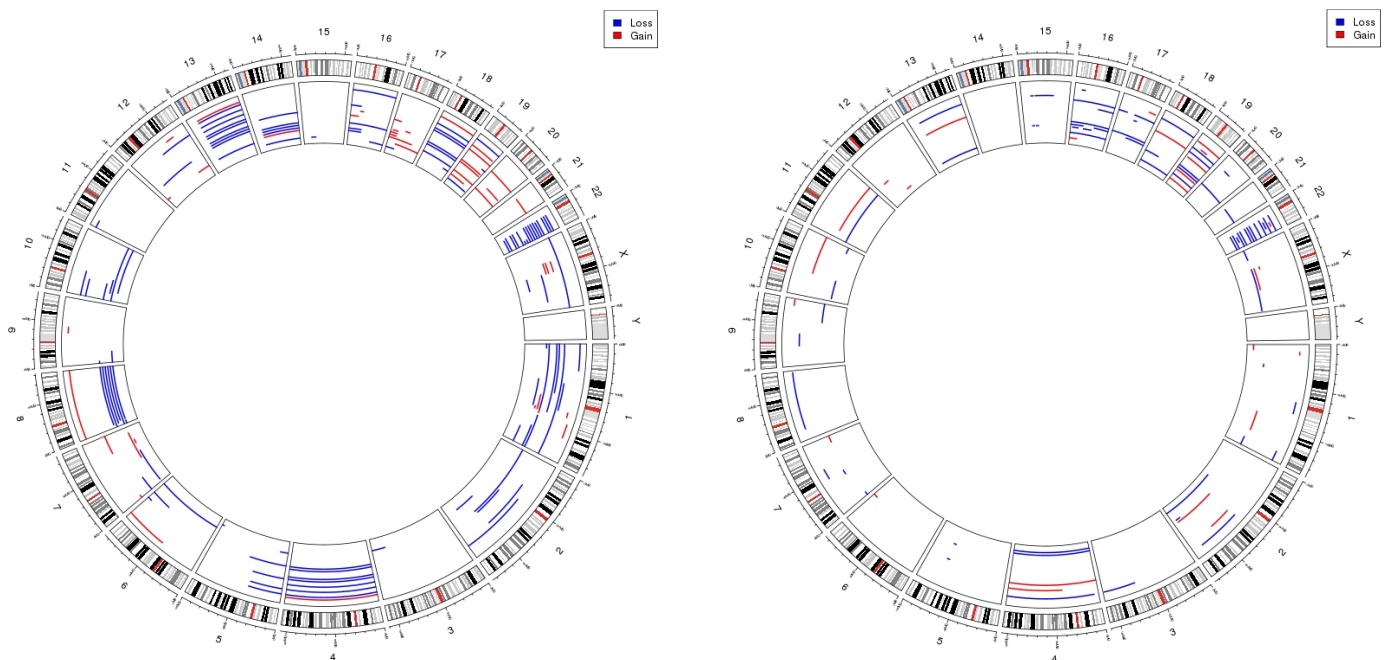
Schwannoma									
Gene Name	Function	Location	# Exons	Total gene size (bp)	Transcript change	Protein change	# Reads of somatic variant/ total reads	# Tumors	# Confirmed by resequencing
<i>PAK2</i>	p21-activated kinase (cytoskeletal)	3:196466728 - 196559518	15	92791	c.1493C>T, c.383A>G	p.P498L, p.K128R	4/24; 9/36	2	0
<i>PRDM1</i>	Represses beta-interferon expression	6:106534195 - 106557814	7	23620	c.2119G>A, c.202delA	p.E707K, p.K68fs	8/54; 12/30	2	2
<i>NUP153</i>	Nuclear pore complex	6:17615266-17707065	22	91800	c.1633A>G, c.3897_3899delITGC	p.I545V, p.A1300del	10/18; 7/19	2	1
<i>RYR2</i>	Ryanodine receptor	1:237205702 - 237997288	105	791587	c.2080C>T, c.10820_10821insT	p.R694*, p.PL3607fs	8/53; 5/16	2	1
<i>UNC5A</i>	Netrin receptor (axonal migration)	5:176237560 - 176307899	15	70340	c.1103C>T, c.1220G>A	p.P368L, p.R407H	10/15; 5/25	2	2
<i>ZCCHC14</i>	Zinc finger, phosphatidylinositol binding	16:87439852 - 87525460	13	85609	c.25A>T, c.17C<G	p.S9C, p.P6R	4/15; 4/19	2	2 (both proved to be germline)
Meningioma									
<i>NLRP1</i>	Ced-4 family of apoptosis proteins	17:5404719-5487832	16	83114	c.1853delG, c.916G>C	p.S618fs, p.E306Q	22/48; 6/17	2	1

We initially attempted to validate the presence of each of these mutations in the corresponding tumor and its absence in the blood DNA using Sanger sequencing of specific PCR products. The results were disappointing, as many variants were not easily seen in the Sanger sequencing. Consequently, we turned to MiSeq targeted

next generation sequencing in an attempt to verify each of these 14 putative somatic mutations. In all, 7 of the 14 candidate variants (those shown in red) were confirmed as present in the tumor DNA and also absent in the constitutional DNA. In the case of *ZCCHC14*, both variants were confirmed in tumor DNA but were also found in the constitutional DNA, indicating that they represent germline changes that were missed by the whole exome scan in the analysis of blood DNA. The 5 remaining variants were not seen in the MiSeq sequencing of tumor DNA. The failure to confirm many of these changes could reflect false positives in the original calling of variants in the exome sequencing or more likely mosaicism in the frozen tumor specimens since a new DNA preparation was used for this second stage. The potential for mosaicism in the tumors is supported by the ratio of reads of the *de novo* somatic variant often being far less than 50% of total reads, even for some tumors where the variant was confirmed by resequencing. Among this list of candidate genes, both *UNC5A* and *PRMD1* mutations were confirmed to be present and somatic in origin in both tumors. As a follow up to this analysis, we have now extracted DNA from an additional 47 schwannomas in which we are performing targeted sequencing of *UNC5A* and *PRMD1* exons to look for additional mutations. We will do the same for the remaining 4 genes on the list only if the second unconfirmed mutation in these genes can be verified by further DNA sequencing. If we identify a deleterious somatic mutation in any of the 47 additional tumors, it could confirm *UNC5A* or *PRMD1* as an important candidate for further evaluation of a role in the genesis and growth of schwannomas, since the first two hits came from scanning only 30 schwannomas (7%).

We also performed dosage analysis using the exome read counts to define chromosomal rearrangements in these tumors. First, we computed read depth coverage metrics for target intervals of at least 20 bp in length that were used in the exome sequencing for each sample in the analysis using GATK's DepthOfCoverage walker with `-minMappingQuality 20` option [2]. Further, coverage metrics were GC-content normalized as described in [12], where GC-content for target intervals was calculated by GATK's GCContentByInterval walker [2]. Next, log2 ratios of normalized read depth between tumor and matched blood for each target interval with > 5X coverage in both test and control samples were calculated. Log2 ratios were further scaled by subtracting the median of all log2 ratios in the sample. Relying on scaled log2 ratios, we used R's DNACopy package to segment the data. Later, segments were merged with VarScan's mergesegments.pl script using -0.4 and 0.4 thresholds for deletions and amplifications respectively [13]. Consistent with prior studies from ourselves and others using dosage array analyses, the exome read counts suggested extensive regions of chromosome loss and some regions of duplication. Dosage changes >5Mb usually contained enough exons to be called reliably, and these events were much more prominent in meningiomas than in schwannomas (Figure 1). The meningiomas frequently displayed dosage changes that affected most or all of a chromosome arm, particularly loss events on chromosomes 4, 8, 13, 14, and 18, and especially on chromosome 22, the site of the *NF2* gene. Such events were less frequent in schwannomas and show a different overall pattern, except for frequent loss of chromosome 22, as expected for a tumor type associated with merlin inactivation.

Figure 1- Dosage alterations by chromosome in meningiomas (left) and schwannomas (right)



Our overall conclusion from this task is that progression of meningiomas occurs predominantly via chromosome rearrangements leading to dosage imbalance rather than through somatic mutation of a limited set of specific progression genes. By contrast, schwannomas show somewhat less dosage imbalance but may harbor specific somatic point mutations in particular genes that contribute to tumor growth. The unequal read counts between mutated and wild-type gene copies suggest that these tumors may be mosaic for the second-hit variations that are detected, indicating that single-cell analysis or *in vitro* modeling studies may be required to fully assess the significance of these somatic events. We are currently preparing a publication that will describe these results, and intend to submit as soon as our follow-up of *UNC5A* and *PRMD1* is completed.

Task 2. RNA and microRNA sequence analysis of meningiomas

Our second specific aim was to perform RNA sequencing (RNA-seq) to define expression profiles relative to normal arachnoid tissue in the same set of meningiomas used for exome analysis above. We performed RNAseq and miRNAseq for 23 primary meningiomas obtained at surgery, 4 meningiomas obtained at autopsy, 4 arachnoid tissue samples obtained at autopsy, a cultured benign meningioma line (BenMen1) [14], a *NF2* heterozygote arachnoidal line (AC7_A3) [15] and 3 *NF2*-null arachnoidal lines isogenic with AC7_A3 except for CRISPR/Cas9 editing of *NF2* (see Table 2).

Table 2 – Isogenic human arachnoidal cell (AC) clones with *NF2* (exon 8) inactivating mutations generated by CRISPR/Cas genome editing

Cell line clone #		NF2 genotype	merlin expression	NF2 mutations
AC_7	A3	WT/null	yes	Exon 8, wildtype
				Exon 15, c.1599_1602delGCAT (het)
AC_7	A4	null/null	no	Exon 15, c.1599_1602delGCAT (het)
				Exon 8, c.787del23bp (het)
				Exon 8, c.804insC (het)
AC_7	A17	null/null	no	Exon 15, c.1599_1602delGCAT (het)
				Exon 8, c.795del8bp (het)
				Exon 8, c.802insT (het)
AC_7	A19	null/null	no	Exon 15, c.1599_1602delGCAT (het)
				Exon 8, c.787del35bp (hom)

RNAseq libraries were prepared using a customized version of a strand-specific dUTP method [16,17]. Libraries were sequenced with 76-bp paired-reads on the Illumina platform. The quality of raw sequence reads were assessed by FastQC (<http://www.bioinformatics.babraham.ac.uk/projects/fastqc/>) and they were further quality trimmed using sickle with options `-q 20 -l 70` [18]. Unfortunately, all autopsy tissues and 1 surgical meningioma specimen yielded libraries that failed quality control metrics, indicating low quality RNA. Consequently these were not analyzed further, but the lack of normal *in vivo* arachnoidal tissue meant the absence in later analyses of a true normal tissue comparison for the meningiomas. Sequences for the remaining 27 libraries were aligned to the human genome (GrCH37, Ensembl build 71) using Gsnap [19] version 2014_12_19. Expression levels of genes in the units of count-per-million were estimated by using bedtools and Ensembl's gene annotation as described in [20] based on uniquely aligned reads. We also prepared and sequenced 36 miRNA libraries 36bp single-end reads on the Illumina platform. The average number of reads per library was 31.7 million and one library failed in sequencing. The raw reads were first trimmed against small-rna sequencing adapters using cutadapt v. with `-e 0.1 -O 5 -m 5` options [21]. We next aligned the reads with length between 16 and 25 nt to known mature miRNA sequences from miRBase database [22] (release 21) using BWA aln with `-n 1` option [23]. The average number of mapped reads per library was 4.56 million as seven libraries yielded less than two million reads.

As an example of the gene expression data, Figure 2 shows a multi-dimensional scaling plot (equivalent to Principal Components Analysis) comparing gene expression in these samples, revealing close clustering of all 3 CRISPR/Cas9 edited *NF2*-null lines (AC7_A4, AC7_A17, AC7_A19, orange font) and the BenMen1 line

(black font), with clear separation from the wild-type arachnoidal line, AC7_A3 (orange font). There is a clear separation of all of these lines from the meningioma specimens (NF2-derived, purple font; sporadic, green font), reflecting the difference between *in vivo* culture and surgical collection. Also evident is a spread of the primary meningioma samples suggesting greater heterogeneity of expression than among the cultured lines, consistent with the extensive dosage changes seen in Task 1 and the non-isogenic nature of the tumors.

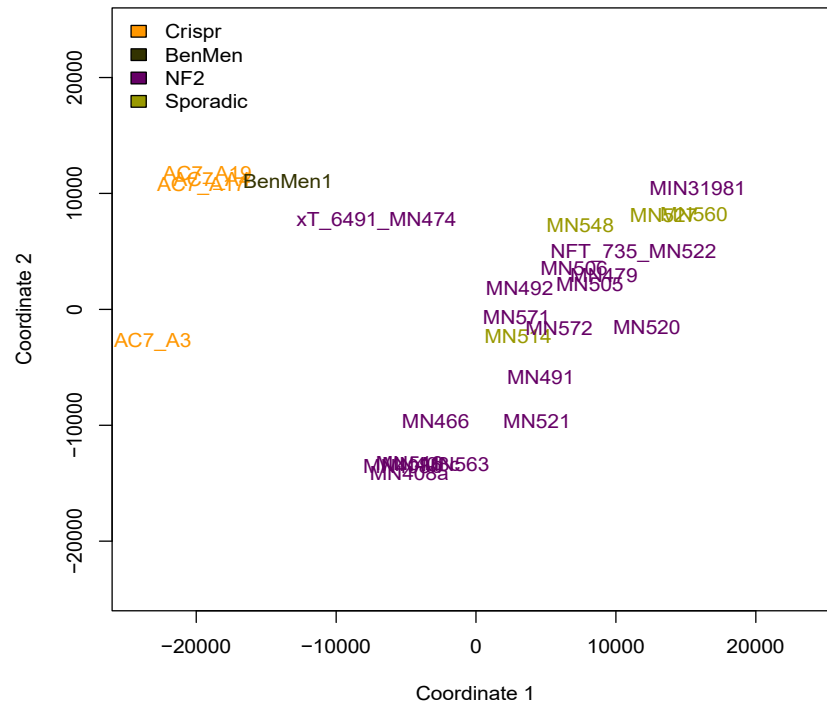


Figure 2- MDS Plot based upon global gene expression

In initial analyses of differential gene expression, we calculated log2 ratios of expression values between test samples and controls and further converted them to Z-scores. After thresholding at > 1 CPM (count per million) in either all treatment samples or in the control sample and A (average log CPM) ≥ -0.5 , 13,536 genes were available for comparison of expression. A total of 942 genes (7%) were defined as differentially expressed ($\text{abs}(M) > \log_2(1.3)$ and top 10% $z > 11.53$): 494 up-regulated and 448 down-regulated by merlin inactivation (a list of these differentially expressed genes is included in the Appendix). Notably, among the top upregulated genes by Z score (2nd on the Appendix list) was *SGK1*, encoding serum/glucocorticoid-regulated kinase 1, which was previously implicated as a potential therapeutic target downstream of MTOR [15].

In the absence of a true tissue control for the primary meningioma specimens (due to the failure of the autopsy tissue specimens to yield high quality RNA libraries), we compared the tumor gene expression to the merlin-expressing arachnoidal cell line, AC7_A3. After thresholding at > 1 CPM in either 12 of the meningiomas or the control sample and $A \geq -0.5$, there were 14,641 genes available for comparison. Of these, 1395 genes (9.5%) were differentially expressed ($\text{abs}(M) > \log_2(2)$ and top 10% $z > 3.149$), 1079 more highly in meningiomas and 316 more highly in the cultured arachnoidal line (the list of these genes is given in the Appendix).

We then performed preliminary GO term and pathway enrichments by DAVID [24] relying on differentially expressed genes identified in the above analyses. The pathways found to be altered by merlin inactivation in the culture cell system are given in Table 3 with the direction of dysregulation of the genes enriched therein, the type and name of the pathway set, along with the number of genes from that set, the P value achieved, the fold enrichment observed and the Benjamini-Hochberg-corrected P value. Shown are all pathway results with a Benjamini P-value < 0.1 due to the weak power of this initial analysis. These pathways reflected a variety of cellular functions including a number of terms associated with mitochondria being enriched for upregulated genes. The most statistically significant terms were associated with downregulation of genes involved in cation/metal binding, reflecting in part of a number of zinc finger protein genes whose expression was reduced.

Table 3- Top pathways enriched for genes up- and down-regulated due to merlin loss in initial, limited arachnoidal cell RNA sequencing data

Effect	Category	Term	Count	PValue	Fold Enrichment	Benjamini P value
Upregulated	GOTERM_CC_FAT	GO:0005739~mitochondrion	64	1.00E-05	1.73	3.52E-03
Upregulated	GOTERM_CC_FAT	GO:0044429~mitochondrial part	41	2.94E-05	1.99	5.17E-03
Upregulated	GOTERM_CC_FAT	GO:0005832~chaperonin-containing T-complex	5	9.10E-05	17.21	1.06E-02
Upregulated	BIOCARTA	h_glycolysisPathway:Glycolysis Pathway	5	2.10E-04	13.74	2.33E-02
Upregulated	GOTERM_CC_FAT	GO:0005829~cytosol	67	4.23E-04	1.50	2.93E-02
Upregulated	GOTERM_CC_FAT	GO:0030532~small nuclear ribonucleoprotein complex	7	3.41E-04	7.03	2.96E-02
Upregulated	GOTERM_CC_FAT	GO:0031975~envelope	38	6.20E-04	1.78	3.07E-02
Upregulated	GOTERM_CC_FAT	GO:0031967~organelle envelope	38	5.74E-04	1.78	3.31E-02
Upregulated	GOTERM_CC_FAT	GO:0005740~mitochondrial envelope	28	9.12E-04	1.97	3.93E-02
Upregulated	GOTERM_CC_FAT	GO:0031966~mitochondrial membrane	26	1.70E-03	1.95	6.45E-02
Downregulated	GOTERM_MF_FAT	GO:0043169~cation binding	136	6.14E-07	1.41	9.76E-05
Downregulated	GOTERM_MF_FAT	GO:0043167~ion binding	137	5.78E-07	1.41	1.38E-04
Downregulated	GOTERM_MF_FAT	GO:0046872~metal ion binding	136	3.64E-07	1.42	1.74E-04
Downregulated	GOTERM_MF_FAT	GO:0008270~zinc ion binding	90	1.95E-05	1.50	2.32E-03
Downregulated	GOTERM_MF_FAT	GO:0005509~calcium ion binding	34	2.79E-05	2.19	2.66E-03
Downregulated	GOTERM_MF_FAT	GO:0046914~transition metal ion binding	98	1.47E-04	1.40	1.16E-02
Downregulated	GOTERM_BP_FAT	GO:0006355~regulation of transcription, DNA-dependent	66	2.26E-05	1.66	1.85E-02
Downregulated	GOTERM_BP_FAT	GO:0045449~regulation of transcription	93	1.34E-05	1.50	2.19E-02
Downregulated	GOTERM_BP_FAT	GO:0051252~regulation of RNA metabolic process	66	5.06E-05	1.62	2.75E-02
Downregulated	REACTOME_PATHWAY	REACT_604:Hemostasis	10	1.31E-03	3.51	3.60E-02
Downregulated	GOTERM_CC_FAT	GO:0005886~plasma membrane	69	9.36E-04	1.43	4.86E-02
Downregulated	GOTERM_BP_FAT	GO:0001501~skeletal system development	18	1.25E-04	2.94	5.03E-02
Downregulated	GOTERM_CC_FAT	GO:0031012~extracellular matrix	16	2.01E-04	3.07	5.20E-02
Downregulated	GOTERM_CC_FAT	GO:0005578~proteinaceous extracellular matrix	14	8.86E-04	2.94	5.73E-02
Downregulated	GOTERM_CC_FAT	GO:0031983~vesicle lumen	5	3.02E-03	8.00	6.48E-02
Downregulated	GOTERM_CC_FAT	GO:0031226~intrinsic to plasma membrane	27	1.76E-03	1.90	6.49E-02
Downregulated	GOTERM_CC_FAT	GO:0044421~extracellular region part	22	2.95E-03	2.00	6.90E-02
Downregulated	GOTERM_CC_FAT	GO:0031093~platelet alpha granule lumen	5	1.65E-03	9.33	7.07E-02
Downregulated	GOTERM_CC_FAT	GO:0016021~integral to membrane	95	8.66E-04	1.32	7.39E-02
Downregulated	GOTERM_CC_FAT	GO:0009986~cell surface	13	2.89E-03	2.71	7.40E-02
Downregulated	GOTERM_CC_FAT	GO:0005887~integral to plasma membrane	26	2.68E-03	1.87	7.63E-02
Downregulated	GOTERM_CC_FAT	GO:0060205~cytoplasmic membrane-bounded vesicle lumen	5	2.50E-03	8.40	7.98E-02
Downregulated	GOTERM_CC_FAT	GO:0031224~intrinsic to membrane	98	7.27E-04	1.31	9.22E-02
Downregulated	GOTERM_CC_FAT	GO:0031091~platelet alpha granule	5	4.99E-03	7.00	9.74E-02

The pathway analyses of the meningioma samples are given in Tables 4 and 5. Table 4 shows that the genes that are more highly expressed in the primary meningiomas than in the cultured arachnoidal cells are enriched in a variety of pathways associated with the immune system and inflammation. We believe that this may reflect the presence of infiltrating immune system cells within the human tumor specimens.

Table 4- Top pathways enriched for genes more highly expressed in merlin-deficient meningiomas than in the merlin-expressing arachnoidal cell line

Category	Term	Count	PValue	Fold Enrichment	Benjamini P-value
GOTERM_BP_FAT	GO:0006955~immune response	72	8.91E-19	3.15	2.31E-15
REACTOME_PATHWAY	REACT_6900:Signaling in Immune system	39	4.67E-14	3.81	2.10E-12
GOTERM_CC_FAT	GO:0005576~extracellular region	121	1.17E-13	1.95	4.36E-11
GOTERM_CC_FAT	GO:0016021~integral to membrane	284	1.53E-11	1.37	1.91E-09
GOTERM_BP_FAT	GO:0006954~inflammatory response	37	5.59E-10	3.18	4.83E-07
KEGG_PATHWAY	hsa04940:Type I diabetes mellitus	12	2.88E-08	7.89	4.49E-06
GOTERM_BP_FAT	GO:0022610~biological adhesion	65	1.29E-08	2.09	4.76E-06
KEGG_PATHWAY	hsa05320:Autoimmune thyroid disease	10	6.15E-08	9.61	4.80E-06
KEGG_PATHWAY	hsa05332:Graft-versus-host disease	10	1.60E-07	8.92	5.00E-06
KEGG_PATHWAY	hsa05330:Allograft rejection	10	1.60E-07	8.92	5.00E-06
GOTERM_BP_FAT	GO:0007155~cell adhesion	65	1.16E-08	2.10	5.03E-06
KEGG_PATHWAY	hsa05310:Asthma	8	1.42E-07	12.49	5.53E-06
KEGG_PATHWAY	hsa05416:Viral myocarditis	15	2.84E-06	4.36	5.53E-05
KEGG_PATHWAY	hsa05322:Systemic lupus erythematosus	14	3.47E-06	4.60	6.01E-05
GOTERM_MF_FAT	GO:0030246~carbohydrate binding	35	2.79E-07	2.63	2.30E-04
REACTOME_PATHWAY	REACT_604:Hemostasis	27	1.06E-05	2.50	2.38E-04
KEGG_PATHWAY	hsa04610:Complement and coagulation cascades	12	2.67E-05	4.54	4.16E-04
GOTERM_BP_FAT	GO:0019724~B cell mediated immunity	13	2.91E-06	5.16	5.03E-04
GOTERM_BP_FAT	GO:0006909~phagocytosis	12	1.42E-05	4.91	2.05E-03
GOTERM_BP_FAT	GO:0002526~acute inflammatory response	14	3.00E-05	3.94	4.09E-03
KEGG_PATHWAY	hsa04640:Hematopoietic cell lineage	11	3.45E-04	3.82	4.48E-03
KEGG_PATHWAY	hsa04360:Axon guidance	20	3.30E-04	2.45	4.66E-03
GOTERM_BP_FAT	GO:0007166~cell surface receptor linked signal transduction	84	5.23E-05	1.54	5.64E-03
GOTERM_BP_FAT	GO:0042110~T cell activation	17	7.78E-05	3.10	7.73E-03

By contrast, the genes that are more highly expressed in the arachnoidal cells than in the meningiomas reveal enrichment in pathways related to extracellular matrix, cytoskeleton and adhesion (Table 5) which could reflect the either upregulation of such genes under *in vitro* culture conditions or the presence of merlin in the arachnoidal cells, or both.

Table 5- Top pathways enriched for genes more highly expressed in the merlin-expressing arachnoidal cell line than in merlin-deficient meningiomas

Category	Term	Count	PValue	Fold Enrichment	Benjamini P-Value
GOTERM_CC_FAT	GO:0005576~extracellular region	47	5.30E-08	2.31	1.53E-05
GOTERM_CC_FAT	GO:0015629~actin cytoskeleton	19	1.39E-06	3.91	2.01E-04
GOTERM_CC_FAT	GO:0005604~basement membrane	10	1.45E-05	6.70	6.96E-04
GOTERM_CC_FAT	GO:0044420~extracellular matrix part	12	9.83E-06	5.48	7.10E-04
GOTERM_CC_FAT	GO:0070161~anchoring junction	14	1.30E-05	4.46	7.51E-04
GOTERM_CC_FAT	GO:0005912~adherens junction	13	2.74E-05	4.50	1.13E-03
GOTERM_CC_FAT	GO:0005886~plasma membrane	71	4.90E-05	1.55	1.77E-03
GOTERM_CC_FAT	GO:0031012~extracellular matrix	17	6.08E-05	3.25	1.95E-03
GOTERM_CC_FAT	GO:0000267~cell fraction	35	9.65E-05	2.01	2.32E-03
GOTERM_CC_FAT	GO:0044459~plasma membrane part	51	9.05E-05	1.71	2.38E-03
GOTERM_CC_FAT	GO:0005578~proteinaceous extracellular matrix	16	8.28E-05	3.33	2.39E-03
GOTERM_CC_FAT	GO:0005856~cytoskeleton	42	1.98E-04	1.79	4.39E-03
GOTERM_CC_FAT	GO:0044449~contractile fiber part	9	3.11E-04	5.17	6.40E-03
GOTERM_CC_FAT	GO:0043292~contractile fiber	9	4.15E-04	4.95	7.97E-03
GOTERM_CC_FAT	GO:0016323~basolateral plasma membrane	12	5.32E-04	3.54	9.56E-03

A major difficulty in more detailed analysis was the lack of a normal *in vivo* arachnoidal tissue comparator due to the failure of all autopsy specimens. This fact, combined with the lack of individual meningioma progression genes emerging from the exome analyses of Task 1 prompted us to focus our efforts on expanding the RNAseq runs with additional replicates of the cultured arachnoidal cells in order to achieve more reliable, robust statistics and to better define the consequences of merlin loss in these isogenic cells, without the confound of other germline or somatic genetic variation. We added triplicate analyses of paired merlin heterozygous and merlin null arachnoidal cells and performed deep RNAseq analysis. To identify statistically differentially expressed (DE) genes from the pairwise comparison we applied the bioconductor package edgeR (v. 3.12.0) on the R platform (v. 3.2.2) to raw count data as expression values using a quasi-likelihood F-test. Significant DE genes were identified at varying stringency levels including nominal p-value < 0.05, Benjamini-Hochberg FDR < 0.05 and Bonferroni FDR < 0.05 (Figure 3).

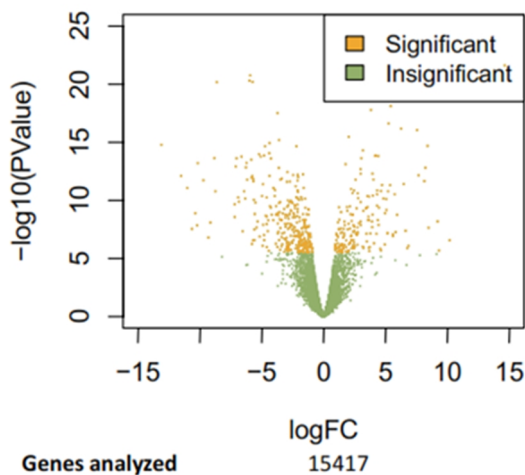


Figure 3 – Differential expression of genes in merlin-null compared with merlin-heterozygous arachnoidal cells at different levels of statistical significance

Under the most stringent conditions, this analysis revealed 181 genes and 320 genes significantly up-regulated or down-regulated, respectively, by merlin deficiency (these differentially expressed genes are given in the Appendix). Among the up-regulated genes were kinases and other genes that could constitute novel targets for therapeutic intervention in meningiomas. These include genes encoding members of the ephrin family of receptors, *EPH4* and *EPHB1*, which were consistently upregulated 3 ($p=7.9 \times 10^{-9}$) and 2.7 fold ($p=1.2 \times 10^{-3}$). A publication summarizing these data is being prepared in conjunction with pathway analyses of the data (see Aim 3) and preliminary testing of potential drug targets so identified in collaboration with the Children's Tumor Foundation NF2 Synodos Consortium.

Task 3. Identification and validation of genes contributing to tumorigenesis

This task was directed at identifying the genes/pathways implicated by somatic alterations as cooperating in meningioma tumor formation or progression to a higher grade tumor and then manipulating those genes using lentiviral-delivered short-hairpin RNAs (shRNA) to specifically suppress the expression of target genes. After funding of the grant, CRISPR/Cas9 genome editing became available to reliably inactivate one or both copies of the locus in question, enabling us to mutate the *NF2* gene and providing us with a technique to obviate shRNA suppression for progression genes. Unfortunately, our data in Aim 1 pointed to the involvement of broad chromosomal regions in progression of meningiomas and did not support the critical importance of any specific genes within these regions. Rather, the development of meningiomas is marked with chromosome instability that favors some genomic regions, but whether this is a direct result of merlin deficiency, or a simple consequence of ascertainment of these events due to their contribution to meningioma cell growth is not clear. While it may theoretically be possible to recreate these chromosomal events in arachnoidal cell lines using CRISPR/Cas9 manipulation, this strategy is not nearly as straightforward as inactivating individual genes and is outside the scope of this grant. However, our work does suggest that the manipulation of chromosome structure using CRISPR/Cas9 may be a useful direction in the future investigation of meningioma mechanisms [25].

While our project did not reveal specific progression genes mutated in meningioma, the gene expression analyses did point to particular genes that are differentially expressed as a result of merlin loss as potential targets for therapeutic intervention as noted under Aim 2. To determine whether the differentially expressed genes from our more robust analysis of the cultured arachnoidal lines clustered into particular functional pathways, we also performed pathway analysis using DAVID (v. 6.7). All analyzed genes were used as a background gene list to define Gene Ontology and pathway terms enriched at Bonferroni FDR < 0.05 for significant DE genes, assembled distinctly for up-regulated, down-regulated and combined DE genes. The results of these analyses are given in Table 6. Notably, the mitochondria-related pathways from the original small-scale analysis disappeared from the list enriched for upregulated genes, to be replaced by far more statistically significant pathways related to extracellular regions and to mitosis (e.g., top pathway $P=1.83E-11$ versus $3.52E-03$ in the previous analysis). Notably, the cation/metal binding pathways disappeared from the list of pathways enriched for downregulated genes, which is now topped at $2.4E-24$ by the same term, GO:0005576~extracellular region, that shows the top enrichment for upregulated genes. Thus, the pathways represented by GO:0005576~extracellular region are highly dysregulated, with some elements increasing and some decreasing in expression due to merlin loss. When both up- and down-regulated genes are considered together in the pathway analysis, GO:0005576~extracellular region achieves a Benjamini-Hochberg corrected P value of $2.89E-40$ confirming the strong enrichment for dysregulated genes, regardless of direction (Table 7). In considering all dysregulated genes, terms related to mitosis fall from their position near the top of pathways enriched for upregulated genes, being replaced near the top of the list by terms related to the extracellular space and matrix, cell adhesion, plasma membrane and integral/intrinsic membrane proteins. This analysis suggests that loss of merlin has major consequences for the interaction between arachnoidal cells and their environment/neighbors and that this disruption is likely to be intimately tied to tumor development due to *NF2* inactivation. It also points to the future potential for using cellular assays based upon extracellular matrix/cell adhesion and activation of particular signaling pathways for drug screening in NF2 and sporadic meningioma, targeting the differential between merlin-expressing and merlin-null arachnoidal cells. A publication reporting these pathway data is being prepared in conjunction with the individual gene DE analysis data (see Aim 2) along with preliminary testing of potential drug targets identified in collaboration with the Children's Tumor Foundation NF2 Synodos Consortium.

Table 6- Top pathways enriched for genes upregulated and downregulated due to merlin loss in expanded arachnoidal cell RNA sequencing data

Effect	Category	Term	Count	PValue	Fold Enrichment	Benjamini P value
Upregulated	GOTERM_BP_FAT	GO:0005576~extracellular region	73	5.76E-14	2.53	1.83E-11
Upregulated	GOTERM_BP_FAT	GO:0044421~extracellular region part	51	1.93E-13	3.19	3.08E-11
Upregulated	GOTERM_BP_FAT	GO:0000279~M phase	36	2.13E-09	3.15	1.23E-06
Upregulated	GOTERM_BP_FAT	GO:0000087~M phase of mitotic cell cycle	31	1.14E-09	3.65	1.32E-06
Upregulated	GOTERM_BP_FAT	GO:0048285~organelle fission	31	1.80E-09	3.58	1.39E-06
Upregulated	GOTERM_BP_FAT	GO:0007067~mitosis	31	7.08E-10	3.72	1.64E-06
Upregulated	GOTERM_BP_FAT	GO:0000280~nuclear division	31	7.08E-10	3.72	1.64E-06
Upregulated	GOTERM_BP_FAT	GO:0005615~extracellular space	31	3.31E-08	3.15	2.64E-06
Upregulated	GOTERM_BP_FAT	GO:0031012~extracellular matrix	27	2.77E-08	3.55	2.94E-06
Upregulated	GOTERM_BP_FAT	GO:0051301~cell division	33	1.63E-08	3.11	7.53E-06
Upregulated	GOTERM_BP_FAT	GO:0005819~spindle	22	2.05E-07	3.82	1.31E-05
Upregulated	GOTERM_BP_FAT	GO:0005578~proteinaceous extracellular matrix	24	3.52E-07	3.44	1.87E-05
Upregulated	GOTERM_BP_FAT	GO:0005886~plasma membrane	107	6.21E-07	1.54	2.83E-05
Upregulated	GOTERM_BP_FAT	GO:0022403~cell cycle phase	38	1.13E-07	2.61	4.35E-05
Upregulated	GOTERM_BP_FAT	GO:0022610~biological adhesion	37	5.37E-07	2.50	1.13E-04
Upregulated	GOTERM_BP_FAT	GO:0051048~negative regulation of secretion	9	5.33E-07	11.12	1.23E-04
Upregulated	GOTERM_BP_FAT	GO:0000278~mitotic cell cycle	36	4.27E-07	2.56	1.24E-04
Upregulated	GOTERM_BP_FAT	GO:0022402~cell cycle process	45	3.88E-07	2.26	1.28E-04
Upregulated	GOTERM_BP_FAT	GO:0007155~cell adhesion	37	5.03E-07	2.50	1.29E-04
Upregulated	GOTERM_BP_FAT	GO:0051783~regulation of nuclear division	12	9.10E-07	6.74	1.76E-04
Upregulated	GOTERM_BP_FAT	GO:0007088~regulation of mitosis	12	9.10E-07	6.74	1.76E-04
Upregulated	GOTERM_BP_FAT	GO:0008083~growth factor activity	14	5.75E-07	5.76	2.91E-04
Upregulated	GOTERM_BP_FAT	GO:0044459~plasma membrane part	74	9.97E-06	1.64	3.97E-04
Upregulated	GOTERM_BP_FAT	GO:0009986~cell surface	21	1.51E-05	3.05	5.34E-04
Upregulated	GOTERM_BP_FAT	GO:0001525~angiogenesis	17	3.62E-06	4.04	6.44E-04
Downregulated	GOTERM_CC_FAT	GO:0005576~extracellular region	135	6.46E-27	2.57	2.40E-24
Downregulated	GOTERM_CC_FAT	GO:0044421~extracellular region part	88	5.74E-22	3.02	1.07E-19
Downregulated	GOTERM_CC_FAT	GO:0005886~plasma membrane	214	2.04E-18	1.70	2.52E-16
Downregulated	GOTERM_CC_FAT	GO:0031012~extracellular matrix	51	1.65E-16	3.68	1.03E-14
Downregulated	GOTERM_BP_FAT	GO:0022610~biological adhesion	75	1.90E-17	2.90	2.41E-14
Downregulated	GOTERM_BP_FAT	GO:0007155~cell adhesion	75	1.62E-17	2.91	4.11E-14
Downregulated	GOTERM_CC_FAT	GO:0005578~proteinaceous extracellular matrix	48	5.98E-16	3.78	4.12E-14
Downregulated	GOTERM_BP_FAT	GO:0007166~cell surface receptor linked signal transduction	104	9.70E-16	2.25	8.44E-13
Downregulated	GOTERM_CC_FAT	GO:0016021~integral to membrane	271	7.51E-14	1.44	4.64E-12
Downregulated	GOTERM_CC_FAT	GO:0031224~intrinsic to membrane	277	1.44E-13	1.42	7.62E-12
Downregulated	GOTERM_MF_FAT	GO:0005509~calcium ion binding	80	1.23E-14	2.50	9.43E-12
Downregulated	GOTERM_CC_FAT	GO:0005887~integral to plasma membrane	81	3.69E-12	2.23	1.71E-10
Downregulated	GOTERM_CC_FAT	GO:0031226~intrinsic to plasma membrane	82	4.68E-12	2.21	1.93E-10
Downregulated	GOTERM_CC_FAT	GO:0005615~extracellular space	48	4.25E-10	2.68	1.58E-08
Downregulated	GOTERM_BP_FAT	GO:0007186~G-protein coupled receptor protein signaling pathway	43	8.39E-11	3.04	5.32E-08
Downregulated	GOTERM_CC_FAT	GO:0044459~plasma membrane part	132	6.30E-09	1.61	2.13E-07
Downregulated	GOTERM_BP_FAT	GO:0016339~calcium-dependent cell-cell adhesion	12	6.22E-10	10.61	3.15E-07
Downregulated	GOTERM_BP_FAT	GO:0016337~cell-cell adhesion	31	7.80E-09	3.30	2.82E-06
Downregulated	GOTERM_BP_FAT	GO:0007156~homophilic cell adhesion	21	7.04E-09	4.64	2.97E-06
Downregulated	GOTERM_BP_FAT	GO:0001501~skeletal system development	36	3.61E-08	2.80	1.14E-05
Downregulated	GOTERM_BP_FAT	GO:0043062~extracellular structure organization	27	6.20E-08	3.35	1.74E-05
Downregulated	GOTERM_BP_FAT	GO:0050877~neurological system process	52	7.60E-08	2.22	1.93E-05
Downregulated	PANTHER_PATHWAY	P00012: Cadherin signaling pathway	23	6.19E-07	3.18	5.38E-05
Downregulated	GOTERM_BP_FAT	GO:0007416~synaptogenesis	11	2.75E-07	7.78	5.80E-05
Downregulated	GOTERM_BP_FAT	GO:0007267~cell-cell signaling	39	2.62E-07	2.47	6.04E-05
Downregulated	REACTOME_PATHWAY	REACT_14797: Signaling by GPCR	16	5.41E-06	3.93	1.89E-04
Downregulated	GOTERM_MF_FAT	GO:0030246~carbohydrate binding	30	7.42E-07	2.77	2.84E-04
Downregulated	GOTERM_CC_FAT	GO:0044420~extracellular matrix part	19	9.22E-06	3.31	2.85E-04
Downregulated	GOTERM_CC_FAT	GO:0005581~collagen	11	2.31E-05	5.14	6.59E-04

Table 7- Top pathways enriched for genes dysregulated (regardless of direction) due to merlin loss in expanded arachnoidal cell RNA sequencing data

Category	Term	Count	PValue	Fold Enrichment	Benjamini P value
GOTERM_CC_FAT	GO:0005576~extracellular region	208	6.41E-43	2.56	2.89E-40
GOTERM_CC_FAT	GO:0044421~extracellular region part	139	1.42E-37	3.08	3.20E-35
GOTERM_CC_FAT	GO:0031012~extracellular matrix	78	2.78E-26	3.64	4.18E-24
GOTERM_CC_FAT	GO:0005886~plasma membrane	321	4.22E-25	1.64	4.76E-23
GOTERM_CC_FAT	GO:0005578~proteinaceous extracellular matrix	72	1.80E-24	3.66	1.63E-22
GOTERM_BP_FAT	GO:0022610~biological adhesion	112	6.63E-25	2.75	1.10E-21
GOTERM_BP_FAT	GO:0007155~cell adhesion	112	5.15E-25	2.76	1.70E-21
GOTERM_CC_FAT	GO:0005615~extracellular space	79	7.50E-19	2.85	5.63E-17
GOTERM_BP_FAT	GO:0007166~cell surface receptor linked signal transduction	149	4.77E-19	2.05	5.25E-16
GOTERM_MF_FAT	GO:0005509~calcium ion binding	113	3.63E-18	2.29	3.41E-15
GOTERM_CC_FAT	GO:0031226~intrinsic to plasma membrane	121	2.63E-16	2.10	1.43E-14
GOTERM_CC_FAT	GO:0005887~integral to plasma membrane	118	6.83E-16	2.10	3.75E-14
GOTERM_CC_FAT	GO:0044459~plasma membrane part	206	3.85E-14	1.62	1.93E-12
GOTERM_CC_FAT	GO:0031224~intrinsic to membrane	403	5.19E-14	1.33	2.34E-12
GOTERM_CC_FAT	GO:0016021~integral to membrane	391	1.06E-13	1.34	4.35E-12
GOTERM_BP_FAT	GO:0043062~extracellular structure organization	41	8.36E-12	3.24	6.91E-09
GOTERM_BP_FAT	GO:0007186~G-protein coupled receptor protein signaling pathway	57	2.19E-11	2.56	1.45E-08
GOTERM_MF_FAT	GO:0030246~carbohydrate binding	47	5.09E-11	2.82	2.39E-08
GOTERM_BP_FAT	GO:0016337~cell-cell adhesion	43	1.22E-10	2.91	6.72E-08
GOTERM_BP_FAT	GO:0007267~cell-cell signaling	58	7.06E-10	2.34	3.33E-07
GOTERM_MF_FAT	GO:0001871~pattern binding	29	1.72E-09	3.52	5.38E-07
GOTERM_MF_FAT	GO:0030247~polysaccharide binding	29	1.72E-09	3.52	5.38E-07
GOTERM_MF_FAT	GO:0005539~glycosaminoglycan binding	27	3.62E-09	3.62	8.52E-07

Key Research Accomplishments

Completion and analysis of exome sequencing of 126 samples representing human tumor (meningioma or schwannoma) and normal DNAs from the same individuals, identifying chromosome rearrangement with broad dosage change as the primary somatic genetic event in meningioma after NF2 inactivation, in contrast to schwannoma where exonic point mutation may play a greater role in tumor growth/progression.

Generation and analysis of RNAseq data from the meningiomas used for exome sequencing identifying probably immune cell infiltration within these tumors and confirming SGK1 as a potential therapeutic target.

Generation and analysis of RNAseq data from isogenic arachnoidal cells with or without inactivation of *NF2*, generated using CRISPR/Cas genome editing technology, defining genes and pathways showing specific altered expression due to merlin loss and implicating *EPH4* and *EPHB1* as potential therapeutic targets.

Conclusion

Exome analysis of meningiomas and schwannomas suggest a different genetic architecture beyond the common element of merlin inactivation in the genesis of these NF2-associated tumor types. Meningiomas display considerable chromosomal rearrangement leading to dosage change of large chromosome regions without implicating specific genes within these regions. By contrast, schwannomas show more frequent evidence of potential cooperating genes altered by point mutation. The gene expression analysis of meningiomas is complicated by the lack of a true control tissue and the evidence for immune cell infiltration, but does confirm serum/glucocorticoid-regulated kinase 1, identified previously in a kinase RNAi suppression screen as a potential target for therapeutic intervention. Use of CRISPR/Cas-edited arachnoidal cells to compare complete merlin inactivation with the heterozygous inactivation seen in NF2 provided isogenic lines that avoided the genetic heterogeneity in human tumors and revealed a number of new potential therapeutic targets, including ephrin family receptor kinases encoded by *EPH4* and *EPHB1*. Loss of merlin coincided with upregulation of a variety of pathways involved with extracellular matrix, cell adhesion and membrane proteins along with sets of genes regulated by MYC and MTORC1. These molecular data provide a foundation for

targeting particular kinases for potential therapeutic intervention in NF2/meningioma and inform the future development of potential drug screening assays to reverse the effects of merlin loss.

Publications, abstracts and presentations

Two publications are in preparation reporting the findings of Aim 1 and Aims2+3, respectively.

Inventions, patents and Licenses

None

Reportable Outcomes

The planned publications will report 1) the knowledge that no frequent single gene mutational events are frequent in meningioma development which, after merlin loss, is associated with considerable chromosomal instability leading to dosage alterations of broad chromosomal regions; 2) the finding that *EPH4* and *EPHB1* may prove to be effective drug targets for NF2/meningioma and 3) the potential for functional assays directly relevant to the molecular and cellular effects of merlin loss as the basis for screens to reverse these deficits and thereby open new therapeutic avenues.

Other Achievements

This project enabled us to join in a large collaboration, the Children's Tumor Foundation-sponsored NF2 Synodos Consortium, aimed at cooperative testing of potential NF2 therapeutics in cell culture and in mouse models, in anticipation of development a human clinical trial.

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Appendices

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

List of genes robustly upregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

List of genes robustly downregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

Gene Symbol	ENSEMBL ID	mean fold change	sd	Z score
<i>DPP3</i>	ENSG00000254986	0.39	0.0007	579.83
<i>SGK1</i>	ENSG00000118515	1.29	0.0026	491.48
<i>ATAD3C</i>	ENSG00000215915	0.47	0.0018	253.55
<i>CCT5</i>	ENSG00000150753	0.69	0.0042	165.42
<i>WDR43</i>	ENSG00000163811	0.44	0.0030	145.22
<i>NLK</i>	ENSG00000087095	0.96	0.0069	139.26
<i>KLC1</i>	ENSG00000256500	0.49	0.0048	102.47
<i>GPATCH4</i>	ENSG00000160818	0.63	0.0068	92.28
<i>TAGLN2P1</i>	ENSG00000253676	0.87	0.0102	85.87
<i>SLC35B4</i>	ENSG00000205060	0.60	0.0075	79.74
<i>CCDC167</i>	ENSG00000198937	0.60	0.0078	76.52
<i>NOP56</i>	ENSG00000101361	0.54	0.0075	72.24
<i>NME1</i>	ENSG00000239672	0.81	0.0112	72.22
<i>TPI1P1</i>	ENSG00000226415	0.48	0.0069	70.47
<i>MRPL22</i>	ENSG00000082515	0.50	0.0074	67.65
<i>SEC23B</i>	ENSG00000101310	0.68	0.0103	66.29
<i>MPV17L2</i>	ENSG00000254858	0.52	0.0080	64.43
<i>ARMCX2</i>	ENSG00000184867	3.96	0.0625	63.34
<i>CORO1C</i>	ENSG00000110880	0.56	0.0089	63.04
<i>FDXR</i>	ENSG00000161513	0.90	0.0143	62.83
<i>TNFSF9</i>	ENSG00000125657	3.72	0.0597	62.25
<i>ME2</i>	ENSG00000082212	0.73	0.0121	60.17
<i>PTPN1</i>	ENSG00000196396	0.52	0.0088	59.39
<i>BRIX1</i>	ENSG00000113460	0.55	0.0097	56.75
<i>DNAJC22</i>	ENSG00000178401	0.65	0.0122	53.12
<i>SEN3-EIF4A1</i>	ENSG00000265500	0.45	0.0087	52.52
<i>ARL6IP1</i>	ENSG00000170540	0.56	0.0107	52.40
<i>CCT3</i>	ENSG00000163468	0.46	0.0087	52.23
<i>NDUFAB1</i>	ENSG00000004779	0.51	0.0100	51.16
<i>TPI1</i>	ENSG00000111669	0.52	0.0102	50.89
<i>EPHA2</i>	ENSG00000142627	0.74	0.0146	50.26
<i>AP1B1</i>	ENSG00000100280	0.55	0.0111	50.11
<i>FAM216A</i>	ENSG00000204856	1.08	0.0219	49.63
<i>FAM122B</i>	ENSG00000156504	0.49	0.0102	48.26
<i>GOT2</i>	ENSG00000125166	0.48	0.0101	47.77
<i>PRMT5</i>	ENSG00000100462	0.68	0.0143	47.46
<i>FAM86B3P</i>	ENSG00000173295	1.37	0.0293	46.94
<i>RBMS2P1</i>	ENSG00000213250	0.54	0.0118	45.85
<i>RP2</i>	ENSG00000102218	0.63	0.0142	44.51
<i>KIF4B</i>	ENSG00000226650	1.52	0.0344	44.24
<i>PSMD2</i>	ENSG00000175166	0.48	0.0113	42.26
<i>UBE2M</i>	ENSG00000130725	0.50	0.0118	42.21
<i>UHMK1</i>	ENSG00000152332	0.56	0.0134	41.44

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>CHAMP1</i>	ENSG00000198824	0.60	0.0146	41.32
<i>OGFOD1</i>	ENSG00000087263	0.44	0.0106	41.04
<i>UCK2</i>	ENSG00000143179	0.88	0.0217	40.58
<i>GEMIN7</i>	ENSG00000142252	0.55	0.0136	40.16
<i>STARD8</i>	ENSG00000130052	0.99	0.0248	40.14
<i>PPP1R35</i>	ENSG00000160813	0.39	0.0100	38.66
<i>RP11-552M11.4</i>	ENSG00000243960	0.74	0.0190	38.65
<i>PRKX</i>	ENSG00000183943	0.85	0.0221	38.55
<i>ZNF668</i>	ENSG00000167394	0.57	0.0151	37.97
<i>MATN2</i>	ENSG00000132561	1.68	0.0443	37.89
<i>GAPDH</i>	ENSG00000111640	0.47	0.0124	37.74
<i>CTD-2066L21.2</i>	ENSG00000251281	1.65	0.0441	37.37
<i>ACTN1</i>	ENSG00000072110	0.67	0.0181	37.09
<i>ATP13A2</i>	ENSG00000159363	0.65	0.0176	36.94
<i>ABHD12</i>	ENSG00000100997	0.98	0.0266	36.89
<i>CDKN1A</i>	ENSG00000124762	0.81	0.0222	36.52
<i>BAX</i>	ENSG00000087088	0.60	0.0168	35.65
<i>MARCH4</i>	ENSG00000144583	3.02	0.0848	35.57
<i>NIN</i>	ENSG00000100503	0.41	0.0117	35.41
<i>TCEB1</i>	ENSG00000154582	0.39	0.0111	35.20
<i>MRPL24</i>	ENSG00000143314	0.41	0.0116	35.12
<i>SDPR</i>	ENSG00000168497	1.28	0.0363	35.12
<i>PARVA</i>	ENSG00000197702	0.53	0.0150	35.10
<i>KIF20A</i>	ENSG00000112984	1.07	0.0308	34.82
<i>MYEOV</i>	ENSG00000172927	3.03	0.0872	34.80
<i>TIMM10</i>	ENSG00000134809	0.58	0.0168	34.78
<i>SPA17</i>	ENSG00000064199	1.35	0.0392	34.40
<i>GEMIN6</i>	ENSG00000152147	0.59	0.0172	34.22
<i>XPO6</i>	ENSG00000169180	0.42	0.0123	33.71
<i>KLC1</i>	ENSG00000126214	0.47	0.0141	33.25
<i>ARL17A</i>	ENSG00000185829	0.61	0.0184	33.01
<i>RP4-614O4.11</i>	ENSG00000261582	0.45	0.0137	32.99
<i>WDR4</i>	ENSG00000160193	0.71	0.0214	32.94
<i>CLPTM1L</i>	ENSG00000049656	0.55	0.0168	32.70
<i>NFU1</i>	ENSG00000169599	0.41	0.0126	32.48
<i>CKS2</i>	ENSG00000123975	0.81	0.0254	31.99
<i>APEX2</i>	ENSG00000169188	0.67	0.0212	31.77
<i>NALCN</i>	ENSG00000102452	1.10	0.0345	31.72
<i>U47924.19</i>	ENSG00000255896	0.66	0.0210	31.45
<i>ALKBH6</i>	ENSG00000239382	0.39	0.0125	31.33
<i>ZFP3</i>	ENSG00000180787	0.60	0.0193	31.29
<i>CRIM1</i>	ENSG00000150938	0.74	0.0237	31.28
<i>CLDN1</i>	ENSG00000163347	2.92	0.0934	31.22
<i>PTCD1</i>	ENSG00000106246	0.42	0.0134	31.15
<i>SFTA1P</i>	ENSG00000225383	4.68	0.1509	31.00
<i>NCAPD2</i>	ENSG00000010292	0.74	0.0239	30.99

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>SCO1</i>	ENSG00000133028	0.51	0.0166	30.61
<i>LMO3</i>	ENSG00000048540	1.82	0.0595	30.59
<i>DNAJC11</i>	ENSG00000007923	0.77	0.0255	30.32
<i>CHCHD3</i>	ENSG00000106554	0.38	0.0126	30.18
<i>APEH</i>	ENSG00000164062	0.53	0.0177	30.09
<i>SNRPF</i>	ENSG00000139343	0.44	0.0149	29.69
<i>RP11-186B7.4</i>	ENSG00000264772	0.43	0.0144	29.63
<i>CITED2</i>	ENSG00000164442	0.97	0.0330	29.25
<i>HOMER3</i>	ENSG00000051128	0.65	0.0223	28.97
<i>CCT7</i>	ENSG00000135624	0.49	0.0169	28.93
<i>CD3EAP</i>	ENSG00000117877	0.97	0.0336	28.77
<i>TFE3</i>	ENSG00000068323	0.45	0.0156	28.75
<i>AXL</i>	ENSG00000167601	1.14	0.0399	28.69
<i>ARHGAP22</i>	ENSG00000128805	1.66	0.0582	28.52
<i>PPM1G</i>	ENSG00000115241	0.41	0.0144	28.46
<i>AKAP2</i>	ENSG00000241978	0.45	0.0158	28.45
<i>SF3B3</i>	ENSG00000189091	0.39	0.0138	28.39
<i>PSMG1</i>	ENSG00000183527	0.62	0.0220	28.28
<i>KRTAP1-5</i>	ENSG00000221852	2.75	0.0978	28.09
<i>COA4</i>	ENSG00000181924	0.41	0.0149	27.77
<i>KIRREL3</i>	ENSG00000149571	1.72	0.0624	27.52
<i>PPP6C</i>	ENSG00000119414	0.43	0.0158	27.48
<i>FAM46B</i>	ENSG00000158246	2.32	0.0850	27.25
<i>CCDC107</i>	ENSG00000159884	0.47	0.0172	27.12
<i>PIM3</i>	ENSG00000198355	0.50	0.0186	27.07
<i>GGH</i>	ENSG00000137563	0.78	0.0290	27.04
<i>BUB3</i>	ENSG00000154473	0.67	0.0249	27.03
<i>TDRKH</i>	ENSG00000182134	0.89	0.0330	26.98
<i>SERPINB7</i>	ENSG00000166396	2.29	0.0850	26.92
<i>DUSP14</i>	ENSG00000161326	0.86	0.0319	26.84
<i>CDKN3</i>	ENSG00000100526	1.25	0.0467	26.71
<i>MON1A</i>	ENSG00000164077	0.39	0.0144	26.70
<i>EIF2S2P3</i>	ENSG00000236493	1.04	0.0391	26.66
<i>FARSB</i>	ENSG00000116120	0.61	0.0232	26.43
<i>HIGD1A</i>	ENSG00000181061	0.43	0.0163	26.41
<i>RNF167</i>	ENSG00000108523	0.42	0.0160	26.21
<i>C6orf211</i>	ENSG00000146476	0.63	0.0240	26.18
<i>ZFP91-CNTF</i>	ENSG00000255073	0.53	0.0204	25.97
<i>MLX</i>	ENSG00000108788	0.58	0.0226	25.86
<i>CTNNAL1</i>	ENSG00000119326	1.33	0.0521	25.54
<i>GCAT</i>	ENSG00000100116	0.66	0.0259	25.48
<i>ADPRHL2</i>	ENSG00000116863	0.49	0.0192	25.46
<i>SNRPC</i>	ENSG00000124562	0.45	0.0179	25.34
<i>ATIC</i>	ENSG00000138363	0.61	0.0240	25.25
<i>SRF</i>	ENSG00000112658	0.40	0.0157	25.24
<i>CTD-2066L21.3</i>	ENSG00000250697	1.67	0.0661	25.20

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<i>WBP4</i>	ENSG00000120688	0.42	0.0166	25.08
<i>PAM16</i>	ENSG00000217930	0.47	0.0189	24.77
<i>CCT2</i>	ENSG00000166226	0.44	0.0178	24.71
<i>IMP3</i>	ENSG00000177971	0.83	0.0337	24.70
<i>SH3RF1</i>	ENSG00000154447	1.26	0.0509	24.68
<i>DDB2</i>	ENSG00000134574	0.88	0.0356	24.68
<i>FGF1</i>	ENSG00000113578	2.67	0.1084	24.62
<i>PKM</i>	ENSG00000067225	0.68	0.0277	24.37
<i>CFL1</i>	ENSG00000172757	0.58	0.0238	24.23
<i>EPB41L2</i>	ENSG00000079819	0.78	0.0322	24.18
<i>ASCC2</i>	ENSG00000100325	0.40	0.0167	24.15
<i>DARS2</i>	ENSG00000117593	0.61	0.0253	24.14
<i>IER3IP1</i>	ENSG00000267228	0.39	0.0163	24.12
<i>NUDCD1</i>	ENSG00000120526	0.84	0.0349	24.11
<i>GOLGA4</i>	ENSG00000144674	0.44	0.0184	23.91
<i>C17orf89</i>	ENSG00000224877	0.54	0.0227	23.77
<i>RCC1</i>	ENSG00000180198	0.56	0.0235	23.63
<i>CRY1</i>	ENSG00000008405	0.82	0.0349	23.56
<i>AC004797.1</i>	ENSG00000229944	0.52	0.0222	23.50
<i>DDAH1</i>	ENSG00000153904	0.86	0.0369	23.45
<i>OGDH</i>	ENSG00000105953	0.45	0.0191	23.38
<i>RP11-21J18.1</i>	ENSG00000265257	0.40	0.0169	23.36
<i>NDUFV2</i>	ENSG00000178127	0.41	0.0175	23.25
<i>TEAD4</i>	ENSG00000197905	0.67	0.0289	23.21
<i>ALS2CL</i>	ENSG00000178038	1.69	0.0731	23.14
<i>MRPS12</i>	ENSG00000128626	0.67	0.0290	23.14
<i>SH2B3</i>	ENSG00000111252	0.39	0.0169	23.09
<i>CLIC3</i>	ENSG00000169583	0.66	0.0287	23.05
<i>ENO1</i>	ENSG00000074800	0.76	0.0334	22.79
<i>RND3</i>	ENSG00000115963	1.41	0.0623	22.62
<i>CNOT7</i>	ENSG00000198791	0.40	0.0178	22.41
<i>KRT34</i>	ENSG00000131737	3.47	0.1563	22.18
<i>DHRS2</i>	ENSG00000100867	1.99	0.0899	22.17
<i>PPAT</i>	ENSG00000128059	0.53	0.0240	22.12
<i>NIPAL3</i>	ENSG00000001461	1.91	0.0872	21.93
<i>CCBE1</i>	ENSG00000183287	2.76	0.1261	21.91
<i>FERMT2</i>	ENSG00000073712	0.46	0.0212	21.86
<i>RUVBL2</i>	ENSG00000183207	0.80	0.0366	21.85
<i>METAP1</i>	ENSG00000164024	0.52	0.0237	21.82
<i>ARHGAP23</i>	ENSG00000225485	0.58	0.0269	21.58
<i>POLDIP2</i>	ENSG00000004142	0.52	0.0246	21.26
<i>TPGS2</i>	ENSG00000134779	0.60	0.0282	21.11
<i>STPG1</i>	ENSG00000001460	1.07	0.0513	20.91
<i>C6orf132</i>	ENSG00000188112	1.19	0.0568	20.91
<i>MRPL46</i>	ENSG00000259494	0.44	0.0213	20.84
<i>APRT</i>	ENSG00000198931	0.51	0.0243	20.79

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<i>EDN1</i>	ENSG00000078401	2.14	0.1028	20.77
<i>KRT7</i>	ENSG00000135480	0.99	0.0480	20.67
<i>PCID2</i>	ENSG00000126226	0.59	0.0288	20.66
<i>EVA1A</i>	ENSG00000115363	1.14	0.0554	20.62
<i>NUP88</i>	ENSG00000108559	0.61	0.0297	20.58
<i>ARMC1</i>	ENSG00000104442	0.41	0.0199	20.53
<i>LRRC8D</i>	ENSG00000171492	1.05	0.0515	20.45
<i>POLR3K</i>	ENSG00000161980	0.83	0.0408	20.41
<i>DNAJC8</i>	ENSG00000126698	0.59	0.0290	20.35
<i>HERC4</i>	ENSG00000148634	1.24	0.0615	20.17
<i>FARSA</i>	ENSG00000179115	0.52	0.0258	20.15
<i>MYBL1</i>	ENSG00000185697	1.30	0.0650	20.07
<i>MPP4</i>	ENSG00000082126	1.33	0.0667	20.03
<i>NEIL3</i>	ENSG00000109674	1.07	0.0534	20.00
<i>PIF1</i>	ENSG00000140451	1.23	0.0613	19.99
<i>HEXB</i>	ENSG00000049860	0.41	0.0204	19.96
<i>ZFP91</i>	ENSG00000186660	0.48	0.0242	19.90
<i>SIPA1L3</i>	ENSG00000105738	0.38	0.0192	19.75
<i>USMG5</i>	ENSG00000173915	0.39	0.0199	19.69
<i>GEMIN2</i>	ENSG00000092208	0.40	0.0202	19.67
<i>EIF4A1</i>	ENSG00000161960	0.39	0.0198	19.63
<i>MRPL44</i>	ENSG00000135900	0.56	0.0289	19.44
<i>SLC25A1</i>	ENSG00000100075	0.50	0.0259	19.43
<i>HSPBP1</i>	ENSG00000133265	0.38	0.0197	19.36
<i>PGAM1</i>	ENSG00000171314	0.81	0.0420	19.29
<i>FLNC</i>	ENSG00000128591	0.74	0.0388	19.14
<i>MRPL35</i>	ENSG00000132313	0.48	0.0251	19.13
<i>MRPS23</i>	ENSG00000181610	0.47	0.0249	19.06
<i>KNSTRN</i>	ENSG00000128944	1.35	0.0708	19.03
<i>CTD-2037K23.2</i>	ENSG00000245556	0.61	0.0323	19.02
<i>KIAA1432</i>	ENSG00000107036	0.52	0.0274	19.01
<i>EIF2B3</i>	ENSG00000070785	0.64	0.0339	19.00
<i>ERCC2</i>	ENSG00000104884	1.19	0.0629	18.95
<i>NHP2</i>	ENSG00000145912	0.57	0.0302	18.94
<i>SOX6</i>	ENSG00000110693	6.22	0.3291	18.91
<i>MRPS18C</i>	ENSG00000163319	0.41	0.0218	18.88
<i>SRSF1</i>	ENSG00000136450	0.48	0.0253	18.78
<i>CAV1</i>	ENSG00000105974	1.37	0.0727	18.78
<i>RTCA</i>	ENSG00000137996	0.41	0.0219	18.77
<i>SORBS3</i>	ENSG00000120896	0.63	0.0337	18.73
<i>PTTG1</i>	ENSG00000164611	1.17	0.0625	18.70
<i>COPS6</i>	ENSG00000168090	0.56	0.0299	18.61
<i>SNHG10</i>	ENSG00000247092	0.61	0.0330	18.55
<i>KIAA1107</i>	ENSG00000069712	0.80	0.0434	18.46
<i>GBE1</i>	ENSG00000114480	0.39	0.0211	18.41
<i>MET</i>	ENSG00000105976	1.39	0.0758	18.34

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<i>STX2</i>	ENSG00000111450	0.52	0.0285	18.31
<i>AOX1</i>	ENSG00000138356	1.99	0.1091	18.27
<i>OAZ1</i>	ENSG00000104904	0.54	0.0297	18.20
<i>GDF11</i>	ENSG00000135414	0.49	0.0272	18.17
<i>ESD</i>	ENSG00000139684	0.63	0.0347	18.10
<i>VTA1</i>	ENSG00000009844	0.48	0.0265	18.09
<i>PSMG4</i>	ENSG00000180822	0.55	0.0306	18.07
<i>STK32B</i>	ENSG00000152953	1.11	0.0614	18.03
<i>C8orf58</i>	ENSG00000241852	0.55	0.0308	17.88
<i>TNFAIP1</i>	ENSG00000109079	1.04	0.0580	17.86
<i>MAP7D3</i>	ENSG00000129680	0.56	0.0311	17.84
<i>ANXA2P2</i>	ENSG00000231991	0.65	0.0367	17.77
<i>EZR</i>	ENSG00000092820	1.28	0.0720	17.77
<i>RWDD2B</i>	ENSG00000156253	0.47	0.0267	17.67
<i>KM-PA-2</i>	ENSG00000204775	0.63	0.0358	17.62
<i>RP11-392A22.2</i>	ENSG00000240875	0.71	0.0400	17.62
<i>CCNB1</i>	ENSG00000134057	1.25	0.0707	17.62
<i>NEK7</i>	ENSG00000151414	1.66	0.0943	17.59
<i>CARD10</i>	ENSG00000100065	0.93	0.0530	17.58
<i>IRS1</i>	ENSG00000169047	1.52	0.0868	17.53
<i>ZDHHC16</i>	ENSG00000171307	0.48	0.0276	17.51
<i>DNAJC6</i>	ENSG00000116675	2.70	0.1544	17.46
<i>GYG1</i>	ENSG00000163754	1.10	0.0634	17.39
<i>METTL3</i>	ENSG00000165819	0.38	0.0220	17.37
<i>RP11-488C13.1</i>	ENSG00000241081	0.52	0.0303	17.31
<i>ISOC2</i>	ENSG00000063241	0.54	0.0315	17.25
<i>SLC25A17</i>	ENSG00000100372	0.38	0.0220	17.23
<i>TSFM</i>	ENSG00000123297	0.42	0.0241	17.21
<i>RNF144B</i>	ENSG00000137393	1.03	0.0597	17.19
<i>TTC9C</i>	ENSG00000162222	0.40	0.0230	17.19
<i>GALNT3</i>	ENSG00000115339	0.96	0.0560	17.16
<i>NOP16</i>	ENSG00000048162	0.73	0.0426	17.12
<i>ENTPD6</i>	ENSG00000197586	0.69	0.0405	17.08
<i>RABGGTB</i>	ENSG00000137955	0.50	0.0294	17.07
<i>EMC9</i>	ENSG00000100908	0.55	0.0321	17.05
<i>KIT</i>	ENSG00000157404	3.93	0.2308	17.03
<i>TMX2</i>	ENSG00000213593	0.45	0.0264	16.98
<i>TFPI</i>	ENSG00000003436	0.78	0.0459	16.94
<i>PTPRQ</i>	ENSG00000139304	3.49	0.2061	16.94
<i>TIMM50</i>	ENSG00000105197	0.38	0.0227	16.86
<i>HIST1H2BK</i>	ENSG00000197903	0.51	0.0306	16.78
<i>FAM129B</i>	ENSG00000136830	0.43	0.0264	16.46
<i>MRPS11</i>	ENSG00000181991	0.41	0.0252	16.44
<i>KIAA0586</i>	ENSG00000100578	0.46	0.0283	16.44
<i>S100A3</i>	ENSG00000188015	1.67	0.1018	16.43
<i>KBTBD6</i>	ENSG00000165572	0.47	0.0288	16.33

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>TUBG1</i>	ENSG00000131462	0.68	0.0420	16.31
<i>MYPN</i>	ENSG00000138347	2.05	0.1260	16.28
<i>SLC44A2</i>	ENSG00000129353	0.43	0.0267	16.24
<i>PGK1</i>	ENSG00000102144	0.63	0.0385	16.22
<i>SH3BP4</i>	ENSG00000130147	0.76	0.0469	16.20
<i>ATP5G1</i>	ENSG00000159199	0.57	0.0353	16.12
<i>TNNT2</i>	ENSG00000118194	0.83	0.0518	16.09
<i>PSMD14</i>	ENSG00000115233	0.51	0.0319	16.09
<i>TNFAIP8L1</i>	ENSG00000185361	1.00	0.0622	16.05
<i>CISD3</i>	ENSG00000230055	0.66	0.0412	15.98
<i>SIGLEC11</i>	ENSG00000269179	0.58	0.0363	15.97
<i>GAS2L3</i>	ENSG00000139354	1.02	0.0642	15.96
<i>PLEKHB2</i>	ENSG00000115762	0.49	0.0307	15.95
<i>NUAK2</i>	ENSG00000163545	2.03	0.1282	15.84
<i>MPDU1</i>	ENSG00000129255	0.41	0.0262	15.78
<i>RP11-490H24.5</i>	ENSG00000216285	0.58	0.0369	15.75
<i>GLRX</i>	ENSG00000173221	0.60	0.0383	15.74
<i>CTD-2207O23.3</i>	ENSG00000268861	0.73	0.0462	15.71
<i>OSBPL3</i>	ENSG00000070882	2.29	0.1458	15.71
<i>ABCF2</i>	ENSG00000033050	0.43	0.0273	15.70
<i>PHF5A</i>	ENSG00000100410	0.46	0.0294	15.70
<i>TAGLN2</i>	ENSG00000158710	0.77	0.0489	15.70
<i>BRI3</i>	ENSG00000164713	0.74	0.0474	15.70
<i>UCHL5</i>	ENSG00000116750	0.59	0.0377	15.69
<i>RAD23B</i>	ENSG00000119318	0.69	0.0441	15.61
<i>EVI5L</i>	ENSG00000142459	0.38	0.0245	15.60
<i>ADK</i>	ENSG00000156110	0.78	0.0501	15.59
<i>AGK</i>	ENSG00000006530	0.43	0.0277	15.59
<i>EZH2</i>	ENSG00000106462	0.50	0.0319	15.53
<i>ZC3HC1</i>	ENSG00000091732	0.39	0.0249	15.52
<i>CDCA3</i>	ENSG00000111665	1.26	0.0816	15.47
<i>DDA1</i>	ENSG00000130311	0.64	0.0414	15.42
<i>VAR5</i>	ENSG00000204394	0.68	0.0441	15.40
<i>NARS2</i>	ENSG00000137513	0.38	0.0249	15.40
<i>PGAM5</i>	ENSG00000247077	0.65	0.0428	15.29
<i>RALA</i>	ENSG00000006451	0.38	0.0250	15.28
<i>BOLA3</i>	ENSG00000163170	0.64	0.0422	15.25
<i>FAM3C2</i>	ENSG00000174028	0.67	0.0440	15.24
<i>PAPSS2</i>	ENSG00000198682	2.07	0.1367	15.15
<i>EHD2</i>	ENSG00000024422	0.61	0.0405	15.12
<i>ZHX3</i>	ENSG00000174306	0.60	0.0396	15.10
<i>SLC7A1</i>	ENSG00000139514	0.76	0.0504	15.05
<i>RAN</i>	ENSG00000132341	0.71	0.0474	14.98
<i>KLHL21</i>	ENSG00000162413	0.52	0.0350	14.88
<i>ATG3</i>	ENSG00000144848	0.51	0.0342	14.87
<i>DKFZP547B0914</i>	ENSG00000269922	0.48	0.0325	14.84

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>C1QBP</i>	ENSG00000108561	0.53	0.0358	14.84
<i>MRPL15</i>	ENSG00000137547	0.44	0.0296	14.76
<i>ANAPC15</i>	ENSG00000110200	0.61	0.0414	14.75
<i>CCDC138</i>	ENSG00000163006	0.43	0.0289	14.75
<i>PALM2-AKAP2</i>	ENSG00000157654	0.43	0.0289	14.73
<i>NRD1</i>	ENSG00000078618	0.55	0.0373	14.70
<i>RAD23BP1</i>	ENSG00000236570	0.56	0.0384	14.67
<i>SLC9A3R2</i>	ENSG00000065054	0.93	0.0634	14.63
<i>RAB3B</i>	ENSG00000169213	1.43	0.0981	14.60
<i>DEPDC1</i>	ENSG00000024526	1.24	0.0853	14.59
<i>GCNT4</i>	ENSG00000176928	3.45	0.2367	14.59
<i>RGMB</i>	ENSG00000174136	1.49	0.1019	14.58
<i>EFTUD1</i>	ENSG00000140598	0.42	0.0287	14.58
<i>PSMB3</i>	ENSG00000108294	0.41	0.0284	14.56
<i>ITGA7</i>	ENSG00000135424	1.66	0.1141	14.54
<i>ZC3H7B</i>	ENSG00000100403	0.44	0.0300	14.53
<i>DCXR</i>	ENSG00000169738	0.55	0.0376	14.51
<i>NDUFAF2</i>	ENSG00000164182	0.39	0.0270	14.50
<i>PHLDA3</i>	ENSG00000174307	0.61	0.0419	14.49
<i>KALRN</i>	ENSG00000160145	2.52	0.1746	14.45
<i>PTRF</i>	ENSG00000177469	0.75	0.0518	14.43
<i>LIPE</i>	ENSG00000079435	0.96	0.0663	14.41
<i>TACO1</i>	ENSG00000136463	0.56	0.0386	14.41
<i>PPIL1</i>	ENSG00000137168	0.59	0.0411	14.37
<i>POLE4</i>	ENSG00000115350	0.50	0.0347	14.37
<i>PNO1</i>	ENSG00000115946	0.50	0.0347	14.37
<i>MAD2L1</i>	ENSG00000164109	0.95	0.0663	14.33
<i>PA2G4P4</i>	ENSG00000230457	0.75	0.0523	14.28
<i>PSENN</i>	ENSG00000205155	0.48	0.0339	14.24
<i>PTPLB</i>	ENSG00000206527	0.78	0.0545	14.24
<i>YWHA</i>	ENSG00000108953	0.40	0.0279	14.15
<i>AP001258.4</i>	ENSG00000245571	1.12	0.0794	14.15
<i>PEA15</i>	ENSG00000162734	0.86	0.0606	14.13
<i>MAD2L2</i>	ENSG00000116670	0.45	0.0319	14.10
<i>JPH2</i>	ENSG00000149596	1.41	0.0999	14.09
<i>EMC6</i>	ENSG00000127774	0.59	0.0422	14.03
<i>STARD13</i>	ENSG00000133121	0.81	0.0576	14.03
<i>ELOVL7</i>	ENSG00000164181	5.21	0.3713	14.03
<i>RP6-109B7.3</i>	ENSG00000241990	1.12	0.0802	14.01
<i>TOMM40</i>	ENSG00000130204	0.71	0.0505	14.00
<i>APITD1-CORT</i>	ENSG00000251503	0.43	0.0306	13.97
<i>SNTB1</i>	ENSG00000172164	1.21	0.0867	13.95
<i>ATP8B1</i>	ENSG00000081923	0.92	0.0662	13.94
<i>CDK7</i>	ENSG00000134058	0.39	0.0279	13.92
<i>GDAP2</i>	ENSG00000196505	0.39	0.0282	13.92
<i>UQCRFS1</i>	ENSG00000169021	0.42	0.0303	13.92

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>RP11-288D9.1</i>	ENSG00000257424	3.24	0.2331	13.91
<i>BTBD3</i>	ENSG00000132640	0.61	0.0442	13.90
<i>TRAK1</i>	ENSG00000182606	0.66	0.0472	13.87
<i>COX20</i>	ENSG00000203667	0.60	0.0435	13.86
<i>ZNF880</i>	ENSG00000221923	1.43	0.1037	13.79
<i>SRGAP2B</i>	ENSG00000196369	0.41	0.0300	13.77
<i>FAM3C</i>	ENSG00000196937	0.71	0.0517	13.75
<i>ARMC7</i>	ENSG00000125449	0.53	0.0388	13.73
<i>SNRPD3</i>	ENSG00000100028	0.42	0.0303	13.72
<i>PKP4</i>	ENSG00000144283	0.99	0.0723	13.71
<i>CXorf38</i>	ENSG00000185753	0.50	0.0364	13.69
<i>BCCIP</i>	ENSG00000107949	0.49	0.0359	13.59
<i>FRMD6</i>	ENSG00000139926	0.89	0.0652	13.59
<i>CRYBB2P1</i>	ENSG00000100058	0.41	0.0301	13.56
<i>ACO1</i>	ENSG00000122729	0.48	0.0358	13.53
<i>PHB</i>	ENSG00000167085	0.44	0.0324	13.49
<i>MAFG-AS1</i>	ENSG00000265688	0.62	0.0459	13.49
<i>PFKP</i>	ENSG00000067057	0.42	0.0313	13.48
<i>TNPO1</i>	ENSG00000083312	0.57	0.0427	13.45
<i>LINC00467</i>	ENSG00000153363	0.91	0.0675	13.44
<i>ANK1</i>	ENSG00000029534	0.93	0.0691	13.42
<i>LOXL2</i>	ENSG00000134013	1.93	0.1435	13.42
<i>RAC1P2</i>	ENSG00000249936	0.45	0.0335	13.42
<i>GAPDHP60</i>	ENSG00000248180	0.64	0.0480	13.42
<i>HN1</i>	ENSG00000189159	0.67	0.0500	13.38
<i>CDC20P1</i>	ENSG00000231007	1.52	0.1133	13.38
<i>AIFM2</i>	ENSG00000042286	0.69	0.0516	13.37
<i>NOP14-AS1</i>	ENSG00000249673	0.50	0.0371	13.36
<i>DLGAP5</i>	ENSG00000126787	1.25	0.0938	13.35
<i>WDR92</i>	ENSG00000243667	0.40	0.0301	13.34
<i>CTDSPL</i>	ENSG00000144677	0.70	0.0523	13.34
<i>CXCL1</i>	ENSG00000163739	1.34	0.1008	13.33
<i>ABCA11P</i>	ENSG00000251595	0.49	0.0373	13.22
<i>MOSPD2</i>	ENSG00000130150	1.12	0.0850	13.22
<i>UBASH3B</i>	ENSG00000154127	0.57	0.0431	13.21
<i>TNC</i>	ENSG00000041982	1.38	0.1044	13.21
<i>EPS8L2</i>	ENSG00000177106	0.90	0.0684	13.20
<i>TMEM97</i>	ENSG00000109084	2.25	0.1712	13.16
<i>GPN1</i>	ENSG00000198522	0.41	0.0314	13.16
<i>RNF145</i>	ENSG00000145860	0.43	0.0330	13.11
<i>HSPD1</i>	ENSG00000144381	0.45	0.0347	13.09
<i>DBF4B</i>	ENSG00000161692	0.75	0.0574	13.08
<i>RP11-879F14.2</i>	ENSG00000267279	1.67	0.1276	13.07
<i>ABT1</i>	ENSG00000146109	0.45	0.0342	13.07
<i>MRPS36</i>	ENSG00000134056	0.56	0.0428	13.05
<i>CCNA2</i>	ENSG00000145386	1.17	0.0901	12.98

List of genes upregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>RP3-406P24.1</i>	ENSG00000216657	0.54	0.0415	12.97
<i>CCT4</i>	ENSG00000115484	0.38	0.0297	12.88
<i>TOMM6</i>	ENSG00000214736	0.38	0.0300	12.84
<i>PPA1</i>	ENSG00000180817	0.52	0.0403	12.83
<i>MCTS1</i>	ENSG00000232119	0.63	0.0488	12.83
<i>PPP1CC</i>	ENSG00000186298	0.46	0.0361	12.83
<i>TAF9</i>	ENSG00000085231	0.54	0.0424	12.82
<i>CLPP</i>	ENSG00000125656	0.52	0.0404	12.81
<i>ARF6</i>	ENSG00000165527	0.57	0.0446	12.80
<i>EMG1</i>	ENSG00000126749	0.57	0.0448	12.79
<i>CCT8</i>	ENSG00000156261	0.44	0.0348	12.75
<i>SBDSP1</i>	ENSG00000225648	0.40	0.0313	12.74
<i>PRR13</i>	ENSG00000205352	0.51	0.0399	12.74
<i>CTD-2302E22.3</i>	ENSG00000258645	1.26	0.0986	12.74
<i>JRK</i>	ENSG00000234616	0.50	0.0394	12.73
<i>RP11-77I22.3</i>	ENSG00000235884	0.63	0.0495	12.72
<i>MNF1</i>	ENSG00000137288	0.39	0.0309	12.64
<i>CDCA7L</i>	ENSG00000164649	2.05	0.1620	12.64
<i>CSTF2</i>	ENSG00000101811	0.54	0.0429	12.62
<i>TSSC1</i>	ENSG00000032389	0.55	0.0439	12.62
<i>GLRX2</i>	ENSG00000023572	0.97	0.0768	12.62
<i>C11orf68</i>	ENSG00000175573	0.44	0.0347	12.62
<i>IPO5</i>	ENSG00000065150	0.54	0.0425	12.61
<i>FAM72B</i>	ENSG00000188610	1.32	0.1046	12.60
<i>PADI1</i>	ENSG00000142623	1.68	0.1332	12.60
<i>STOM</i>	ENSG00000148175	0.80	0.0634	12.56
<i>DPH2</i>	ENSG00000132768	0.59	0.0466	12.56
<i>NRG1</i>	ENSG00000157168	4.70	0.3747	12.54
<i>CHEK2</i>	ENSG00000183765	0.77	0.0613	12.53
<i>RAC3</i>	ENSG00000169750	0.51	0.0407	12.51
<i>SOX13</i>	ENSG00000143842	1.61	0.1290	12.50
<i>KIAA1161</i>	ENSG00000164976	0.59	0.0475	12.46
<i>LLGL2</i>	ENSG00000073350	0.76	0.0607	12.44
<i>SMIM12</i>	ENSG00000163866	0.53	0.0423	12.44
<i>RP11-490M8.1</i>	ENSG00000260025	1.13	0.0915	12.40
<i>NDUFV2P1</i>	ENSG00000267809	0.60	0.0488	12.37
<i>ALDOC</i>	ENSG00000109107	0.55	0.0449	12.35
<i>CDK2AP2</i>	ENSG00000167797	0.56	0.0455	12.33
<i>TOX</i>	ENSG00000198846	1.64	0.1335	12.27
<i>NME7</i>	ENSG00000143156	0.70	0.0569	12.26
<i>SNRPG</i>	ENSG00000143977	0.51	0.0418	12.23
<i>TEAD1</i>	ENSG00000187079	0.58	0.0480	12.14
<i>RANGAP1</i>	ENSG00000100401	0.96	0.0789	12.13
<i>CENPN</i>	ENSG00000166451	0.90	0.0738	12.12
<i>STXBP6</i>	ENSG00000168952	3.12	0.2577	12.12
<i>DNAJC7</i>	ENSG00000168259	0.43	0.0354	12.11

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<i>QSOX1</i>	ENSG00000116260	0.96	0.0792	12.10
<i>RAB8A</i>	ENSG00000167461	0.52	0.0432	12.02
<i>PFN1</i>	ENSG00000108518	0.78	0.0651	11.99
<i>CCDC51</i>	ENSG00000164051	0.85	0.0712	11.99
<i>AMOTL2</i>	ENSG00000114019	0.68	0.0569	11.99
<i>CKAP2</i>	ENSG00000136108	0.85	0.0711	11.95
<i>C19orf25</i>	ENSG00000119559	0.66	0.0554	11.93
<i>CENPE</i>	ENSG00000138778	1.32	0.1106	11.93
<i>USP39</i>	ENSG00000168883	0.45	0.0374	11.93
<i>STC2</i>	ENSG00000113739	0.38	0.0320	11.91
<i>AJUBA</i>	ENSG00000129474	0.72	0.0604	11.89
<i>SKA2</i>	ENSG00000182628	0.77	0.0652	11.84
<i>RRS1</i>	ENSG00000179041	0.99	0.0837	11.82
<i>TAF1D</i>	ENSG00000166012	0.44	0.0371	11.81
<i>MYRIP</i>	ENSG00000170011	3.46	0.2929	11.81
<i>CARS2</i>	ENSG00000134905	0.52	0.0442	11.79
<i>LSM4</i>	ENSG00000130520	0.86	0.0731	11.76
<i>OCLN</i>	ENSG00000197822	1.00	0.0847	11.76
<i>GNG12</i>	ENSG00000172380	0.52	0.0442	11.74
<i>FYN</i>	ENSG00000010810	0.94	0.0804	11.71
<i>IP6K3</i>	ENSG00000161896	2.05	0.1754	11.71
<i>NDUFS6</i>	ENSG00000145494	0.51	0.0438	11.70
<i>CBX1</i>	ENSG00000108468	0.44	0.0375	11.70
<i>RPA3</i>	ENSG00000106399	0.77	0.0655	11.68
<i>SCD5</i>	ENSG00000145284	0.52	0.0444	11.68
<i>ADA</i>	ENSG00000196839	1.38	0.1184	11.67
<i>RRP15</i>	ENSG00000067533	0.51	0.0439	11.65
<i>OARD1</i>	ENSG00000124596	0.52	0.0447	11.65
<i>EIF5A</i>	ENSG00000132507	0.44	0.0375	11.64
<i>HRAS</i>	ENSG00000174775	0.60	0.0516	11.63
<i>EXOSC8</i>	ENSG00000120699	0.51	0.0440	11.62
<i>FAM83G</i>	ENSG00000188522	0.53	0.0454	11.61
<i>CMC2</i>	ENSG00000103121	0.53	0.0453	11.59
<i>NEK2</i>	ENSG00000117650	1.20	0.1033	11.58
<i>MRPS24</i>	ENSG00000062582	0.65	0.0565	11.54
<i>FST</i>	ENSG00000134363	2.01	0.1740	11.54
<i>STK4</i>	ENSG00000101109	0.47	0.0406	11.54

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

Gene Symbol	ENSEMBL ID	mean fold change	sd	Z score
<i>GTF2IRD2B</i>	ENSG00000174428	-1.34	0.0024	-545.53
<i>NBL1</i>	ENSG00000270136	-0.74	0.0022	-343.88
<i>DNMT3A</i>	ENSG00000119772	-1.31	0.0054	-241.91
<i>ACADVL</i>	ENSG00000072778	-0.69	0.0035	-196.03
<i>FAM171A2</i>	ENSG00000161682	-1.34	0.0115	-115.94
<i>SAMD11</i>	ENSG00000187634	-4.58	0.0453	-101.24
<i>ZNF605</i>	ENSG00000196458	-0.79	0.0085	-93.72
<i>ABCA10</i>	ENSG00000154263	-1.35	0.0152	-88.77
<i>KLF3</i>	ENSG00000109787	-0.93	0.0109	-85.14
<i>RP11-96C23.11</i>	ENSG00000261011	-1.78	0.0217	-82.18
<i>PAQR8</i>	ENSG00000170915	-1.36	0.0167	-81.79
<i>ZNF713</i>	ENSG00000178665	-2.12	0.0259	-81.79
<i>MDM4</i>	ENSG00000198625	-0.84	0.0116	-71.97
<i>CDON</i>	ENSG00000064309	-3.71	0.0532	-69.73
<i>SLC44A1</i>	ENSG00000070214	-0.74	0.0107	-69.46
<i>DEAF1</i>	ENSG00000177030	-0.54	0.0082	-66.14
<i>ZMYM5</i>	ENSG00000132950	-0.76	0.0119	-63.62
<i>SETD5-AS1</i>	ENSG00000206573	-0.48	0.0077	-62.63
<i>KIAA1755</i>	ENSG00000149633	-4.70	0.0755	-62.21
<i>ANKH</i>	ENSG00000154122	-2.94	0.0485	-60.70
<i>ZNF836</i>	ENSG00000196267	-0.77	0.0135	-57.27
<i>ZNF333</i>	ENSG00000160961	-0.66	0.0117	-56.98
<i>CA11</i>	ENSG00000063180	-2.28	0.0403	-56.68
<i>MAFF</i>	ENSG00000185022	-0.59	0.0105	-55.85
<i>FAM155A</i>	ENSG00000204442	-0.97	0.0175	-55.48
<i>SMIM11</i>	ENSG00000205670	-0.51	0.0092	-55.05
<i>ZC2HC1A</i>	ENSG00000104427	-0.67	0.0122	-54.69
<i>KDM2A</i>	ENSG00000173120	-0.45	0.0085	-52.53
<i>CABLES1</i>	ENSG00000134508	-1.92	0.0372	-51.65
<i>DOCK4</i>	ENSG00000128512	-1.32	0.0268	-49.38
<i>DPY19L1</i>	ENSG00000173852	-1.01	0.0208	-48.67
<i>HERC2P9</i>	ENSG00000206149	-0.45	0.0094	-47.58
<i>CYHR1</i>	ENSG00000187954	-0.47	0.0100	-47.13
<i>TSPAN31</i>	ENSG00000135452	-0.39	0.0085	-46.24
<i>REV3L</i>	ENSG00000009413	-0.72	0.0158	-45.61
<i>PROS1</i>	ENSG00000184500	-1.53	0.0335	-45.59
<i>LRIG3</i>	ENSG00000139263	-1.46	0.0335	-43.64
<i>C7orf53</i>	ENSG00000181016	-1.19	0.0280	-42.47
<i>PAM</i>	ENSG00000145730	-0.65	0.0159	-40.73
<i>SH3GLB2</i>	ENSG00000148341	-0.87	0.0217	-40.20
<i>ATG16L2</i>	ENSG00000168010	-1.14	0.0284	-40.12
<i>UBE2F</i>	ENSG00000258984	-0.40	0.0101	-39.78
<i>GULP1</i>	ENSG00000144366	-1.50	0.0382	-39.32

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<i>PRSS3</i>	ENSG00000010438	-0.71	0.0184	-38.86
<i>CCNL1</i>	ENSG000000163660	-0.73	0.0187	-38.79
<i>SCN3A</i>	ENSG000000153253	-3.60	0.0933	-38.59
<i>NCOA1</i>	ENSG000000084676	-0.53	0.0139	-38.46
<i>AC005562.1</i>	ENSG000000214719	-0.38	0.0102	-37.60
<i>PGAP3</i>	ENSG000000161395	-1.02	0.0272	-37.28
<i>RNASEL</i>	ENSG000000135828	-0.92	0.0248	-37.04
<i>RASL11A</i>	ENSG000000122035	-3.54	0.0960	-36.89
<i>PI4KAP2</i>	ENSG000000183506	-0.89	0.0247	-36.13
<i>ATHL1</i>	ENSG000000142102	-0.75	0.0208	-36.05
<i>EGR2</i>	ENSG000000122877	-3.10	0.0880	-35.27
<i>GPC6</i>	ENSG000000183098	-1.92	0.0548	-35.03
<i>MBTD1</i>	ENSG000000011258	-0.66	0.0196	-33.60
<i>CREBRF</i>	ENSG000000164463	-1.01	0.0303	-33.32
<i>CTD-3247F14.2</i>	ENSG000000261026	-4.46	0.1354	-32.95
<i>TIMP1</i>	ENSG000000102265	-0.46	0.0140	-32.78
<i>CD302</i>	ENSG000000241399	-1.39	0.0428	-32.52
<i>MBTPS1</i>	ENSG000000140943	-0.45	0.0142	-32.14
<i>ZNF266</i>	ENSG000000174652	-0.53	0.0166	-32.13
<i>TMEM216</i>	ENSG000000187049	-0.68	0.0214	-32.03
<i>DDIT4L</i>	ENSG000000145358	-2.97	0.0944	-31.48
<i>CNTNAP3</i>	ENSG000000106714	-2.89	0.0920	-31.43
<i>SYNDIG1</i>	ENSG000000101463	-2.92	0.0929	-31.40
<i>DYNC2H1</i>	ENSG000000187240	-0.52	0.0166	-31.25
<i>FKBP7</i>	ENSG000000079150	-0.92	0.0297	-30.83
<i>DISP1</i>	ENSG000000154309	-1.72	0.0560	-30.67
<i>ELOVL5</i>	ENSG000000012660	-0.60	0.0196	-30.43
<i>RAB33B</i>	ENSG000000172007	-0.73	0.0242	-30.19
<i>GPR173</i>	ENSG000000184194	-1.24	0.0412	-30.19
<i>GOLGA6L5</i>	ENSG000000230373	-1.24	0.0411	-30.10
<i>HGSNAT</i>	ENSG000000165102	-0.55	0.0187	-29.20
<i>PCDH18</i>	ENSG000000189184	-1.50	0.0518	-28.97
<i>OSR1</i>	ENSG000000143867	-1.07	0.0370	-28.79
<i>MARCH8</i>	ENSG000000165406	-0.47	0.0166	-28.43
<i>DGKI</i>	ENSG000000157680	-1.41	0.0496	-28.36
<i>GPR125</i>	ENSG000000152990	-0.73	0.0257	-28.32
<i>ZMYM2</i>	ENSG000000121741	-0.48	0.0171	-28.27
<i>ADAMTS14</i>	ENSG000000138316	-0.97	0.0346	-27.95
<i>LPIN2</i>	ENSG000000101577	-0.40	0.0145	-27.94
<i>LAG3</i>	ENSG000000089692	-1.86	0.0667	-27.82
<i>GEM</i>	ENSG000000164949	-1.12	0.0405	-27.74
<i>KDM1B</i>	ENSG000000165097	-0.88	0.0318	-27.65
<i>RP11-1407O15.2</i>	ENSG000000174093	-0.63	0.0230	-27.30
<i>SLC38A2</i>	ENSG000000134294	-1.24	0.0457	-27.16
<i>LRP4</i>	ENSG000000134569	-3.72	0.1391	-26.77

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<i>CCDC120</i>	ENSG00000147144	-1.25	0.0468	-26.72
<i>PCDHB8</i>	ENSG00000120322	-3.33	0.1255	-26.57
<i>KIAA1683</i>	ENSG00000130518	-2.68	0.1010	-26.49
<i>ESYT2</i>	ENSG00000117868	-0.64	0.0244	-26.34
<i>PPAP2A</i>	ENSG00000067113	-1.16	0.0442	-26.18
<i>LTBP3</i>	ENSG00000168056	-1.65	0.0630	-26.13
<i>SMARCD3</i>	ENSG00000082014	-1.38	0.0530	-26.05
<i>PLXNA4</i>	ENSG00000221866	-4.10	0.1576	-25.99
<i>NSMF</i>	ENSG00000165802	-1.45	0.0559	-25.89
<i>DOCK5</i>	ENSG00000147459	-0.38	0.0148	-25.78
<i>GNB3</i>	ENSG00000111664	-1.57	0.0610	-25.64
<i>BOC</i>	ENSG00000144857	-3.85	0.1501	-25.62
<i>NEIL1</i>	ENSG00000140398	-1.95	0.0769	-25.36
<i>SOX4</i>	ENSG00000124766	-3.29	0.1296	-25.36
<i>DCN</i>	ENSG00000011465	-1.27	0.0504	-25.12
<i>KLF13</i>	ENSG00000169926	-0.99	0.0396	-25.10
<i>ATXN3</i>	ENSG00000066427	-0.58	0.0233	-24.91
<i>SIAH1</i>	ENSG00000196470	-0.44	0.0181	-24.45
<i>NIPAL2</i>	ENSG00000104361	-1.52	0.0622	-24.41
<i>YPEL3</i>	ENSG00000090238	-1.12	0.0460	-24.32
<i>SSR1</i>	ENSG00000124783	-0.41	0.0168	-24.20
<i>POU6F1</i>	ENSG00000184271	-2.01	0.0834	-24.14
<i>WSB1</i>	ENSG00000109046	-0.89	0.0368	-24.07
<i>SLC20A1</i>	ENSG00000144136	-0.66	0.0275	-23.97
<i>RAI2</i>	ENSG00000131831	-4.87	0.2043	-23.86
<i>SGSM2</i>	ENSG00000141258	-0.66	0.0277	-23.85
<i>ITGB8</i>	ENSG00000105855	-3.97	0.1673	-23.70
<i>TRIM62</i>	ENSG00000116525	-1.77	0.0746	-23.68
<i>CRTC3</i>	ENSG00000140577	-0.62	0.0263	-23.35
<i>RP11-875O11.1</i>	ENSG00000245025	-1.04	0.0445	-23.30
<i>MRC2</i>	ENSG00000011028	-1.02	0.0441	-23.17
<i>PDE4A</i>	ENSG00000065989	-0.90	0.0387	-23.14
<i>RUNX1</i>	ENSG00000159216	-0.99	0.0427	-23.09
<i>HDAC6</i>	ENSG00000094631	-0.44	0.0189	-23.07
<i>NUDT4</i>	ENSG00000173598	-0.60	0.0262	-22.89
<i>SH3BP2</i>	ENSG00000087266	-0.74	0.0325	-22.86
<i>RNF103</i>	ENSG00000239305	-0.74	0.0324	-22.79
<i>PHLDB2</i>	ENSG00000144824	-0.63	0.0278	-22.59
<i>TTLL3</i>	ENSG00000214021	-1.84	0.0816	-22.57
<i>S1PR2</i>	ENSG00000267534	-1.03	0.0462	-22.34
<i>SLC9A9</i>	ENSG00000181804	-2.37	0.1067	-22.20
<i>CCDC92</i>	ENSG00000119242	-0.94	0.0426	-22.15
<i>PEAK1</i>	ENSG00000173517	-0.52	0.0237	-22.00
<i>DHRS3</i>	ENSG00000162496	-1.47	0.0669	-22.00
<i>LGALS3</i>	ENSG00000131981	-1.29	0.0584	-22.00
<i>RBPJ</i>	ENSG00000168214	-0.55	0.0253	-21.93

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<i>RP11-159D12.2</i>	ENSG00000264112	-0.73	0.0332	-21.87
<i>ZNF117</i>	ENSG00000152926	-1.70	0.0779	-21.85
<i>RP11-274B21.2</i>	ENSG00000243302	-0.64	0.0295	-21.72
<i>TTBK2</i>	ENSG00000128881	-0.78	0.0359	-21.66
<i>PTTG1IP</i>	ENSG00000183255	-0.38	0.0178	-21.62
<i>L3MBTL1</i>	ENSG00000185513	-1.10	0.0508	-21.61
<i>BMPR2</i>	ENSG00000204217	-0.39	0.0179	-21.57
<i>AHCYL2</i>	ENSG00000158467	-2.99	0.1393	-21.46
<i>RP4-657D16.3</i>	ENSG00000266993	-1.70	0.0792	-21.46
<i>AUH</i>	ENSG00000148090	-0.78	0.0362	-21.45
<i>PLCL1</i>	ENSG00000115896	-5.34	0.2490	-21.44
<i>SESTD1</i>	ENSG00000187231	-0.87	0.0406	-21.34
<i>AAED1</i>	ENSG00000158122	-0.67	0.0313	-21.26
<i>RP4-773N10.4</i>	ENSG00000258634	-0.63	0.0299	-21.11
<i>MERTK</i>	ENSG00000153208	-2.68	0.1272	-21.10
<i>NCOA2</i>	ENSG00000140396	-0.64	0.0303	-21.03
<i>SIX5</i>	ENSG00000177045	-0.56	0.0266	-21.01
<i>KIAA0247</i>	ENSG00000100647	-1.21	0.0579	-20.93
<i>AKAP1</i>	ENSG00000121057	-0.96	0.0461	-20.91
<i>P4HTM</i>	ENSG00000178467	-0.53	0.0256	-20.83
<i>ARHGAP5</i>	ENSG00000100852	-0.51	0.0246	-20.79
<i>PKDCC</i>	ENSG00000162878	-2.26	0.1086	-20.77
<i>GRK5</i>	ENSG00000198873	-1.23	0.0593	-20.75
<i>PRRT2</i>	ENSG00000167371	-1.61	0.0777	-20.68
<i>YPEL1</i>	ENSG00000100027	-4.59	0.2228	-20.59
<i>FAM8A1</i>	ENSG00000137414	-1.66	0.0808	-20.58
<i>DMTF1</i>	ENSG00000135164	-0.47	0.0230	-20.40
<i>GBA2</i>	ENSG00000070610	-0.42	0.0206	-20.29
<i>THOC6</i>	ENSG00000131652	-1.25	0.0619	-20.26
<i>ATP6V0E2-AS1</i>	ENSG00000204934	-0.58	0.0286	-20.25
<i>AKR7L</i>	ENSG00000211454	-1.52	0.0750	-20.22
<i>RAB27B</i>	ENSG00000041353	-1.35	0.0672	-20.07
<i>PIAS2</i>	ENSG00000078043	-0.52	0.0261	-20.04
<i>DTNB</i>	ENSG00000138101	-1.40	0.0703	-19.95
<i>CCDC159</i>	ENSG00000183401	-1.48	0.0742	-19.92
<i>TPT1-AS1</i>	ENSG00000170919	-0.99	0.0499	-19.85
<i>RRAGB</i>	ENSG00000083750	-0.82	0.0413	-19.78
<i>PPFIBP1</i>	ENSG00000110841	-2.50	0.1264	-19.77
<i>ICA1L</i>	ENSG00000163596	-1.60	0.0813	-19.72
<i>TDRD3</i>	ENSG00000083544	-0.40	0.0202	-19.66
<i>GFPT2</i>	ENSG00000131459	-1.79	0.0919	-19.52
<i>WASL</i>	ENSG00000106299	-0.62	0.0318	-19.48
<i>CFLAR</i>	ENSG00000003402	-0.45	0.0231	-19.41
<i>TNRC6B</i>	ENSG00000100354	-0.60	0.0309	-19.41
<i>CTDSP2</i>	ENSG00000175215	-0.49	0.0252	-19.40
<i>ZNF445</i>	ENSG00000185219	-0.57	0.0292	-19.39

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<i>ZCCHC14</i>	ENSG00000140948	-1.49	0.0771	-19.33
<i>EVC</i>	ENSG00000072840	-0.62	0.0323	-19.26
<i>VPS13C</i>	ENSG00000129003	-0.56	0.0291	-19.19
<i>AKAP9</i>	ENSG00000127914	-0.58	0.0303	-19.09
<i>MAPK1</i>	ENSG00000100030	-0.43	0.0224	-19.03
<i>PCDHB6</i>	ENSG00000113211	-1.96	0.1029	-19.03
<i>CCNB1IP1</i>	ENSG00000100814	-0.48	0.0252	-18.97
<i>RP11-815I9.4</i>	ENSG00000264885	-0.82	0.0435	-18.93
<i>GPR1</i>	ENSG00000183671	-0.69	0.0369	-18.80
<i>WWTR1</i>	ENSG00000018408	-0.97	0.0516	-18.79
<i>ZNF32</i>	ENSG00000169740	-0.54	0.0286	-18.76
<i>FBXL17</i>	ENSG00000145743	-0.49	0.0261	-18.64
<i>DIXDC1</i>	ENSG00000150764	-1.24	0.0667	-18.59
<i>TP53I3</i>	ENSG00000115129	-0.52	0.0280	-18.58
<i>GRN</i>	ENSG00000030582	-0.55	0.0299	-18.43
<i>ZBTB14</i>	ENSG00000198081	-0.51	0.0277	-18.36
<i>ZNF10</i>	ENSG00000256223	-1.04	0.0566	-18.36
<i>AF131215.9</i>	ENSG00000269918	-0.93	0.0508	-18.35
<i>NISCH</i>	ENSG00000010322	-0.57	0.0312	-18.29
<i>FAM89B</i>	ENSG00000176973	-0.76	0.0417	-18.27
<i>LPP</i>	ENSG00000145012	-0.52	0.0286	-18.26
<i>ERV3-1</i>	ENSG00000213462	-1.30	0.0711	-18.26
<i>WDR60</i>	ENSG00000126870	-0.46	0.0256	-18.10
<i>TTC3</i>	ENSG00000182670	-0.80	0.0444	-18.02
<i>DNAH10OS</i>	ENSG00000250091	-2.06	0.1145	-17.98
<i>RP11-54O7.3</i>	ENSG00000223764	-3.35	0.1871	-17.88
<i>C14orf159</i>	ENSG00000133943	-2.12	0.1186	-17.86
<i>OS9</i>	ENSG00000135506	-0.43	0.0240	-17.84
<i>PRRX1</i>	ENSG00000116132	-0.80	0.0452	-17.78
<i>VPS13A</i>	ENSG00000197969	-0.40	0.0228	-17.67
<i>CTSA</i>	ENSG00000064601	-0.73	0.0416	-17.63
<i>ARMC9</i>	ENSG00000135931	-1.40	0.0799	-17.57
<i>KDM3A</i>	ENSG00000115548	-0.79	0.0448	-17.54
<i>INSR</i>	ENSG00000171105	-1.07	0.0614	-17.49
<i>FYCO1</i>	ENSG00000163820	-0.93	0.0533	-17.47
<i>ZNF573</i>	ENSG00000189144	-0.45	0.0257	-17.45
<i>MEIS3</i>	ENSG00000105419	-0.46	0.0264	-17.41
<i>N4BP2L1</i>	ENSG00000139597	-2.61	0.1505	-17.37
<i>MGAT4B</i>	ENSG00000161013	-0.64	0.0369	-17.35
<i>PLK3</i>	ENSG00000173846	-0.66	0.0382	-17.32
<i>STIM2</i>	ENSG00000109689	-0.72	0.0418	-17.26
<i>CTD-2545G14.7</i>	ENSG00000262526	-0.39	0.0229	-17.23
<i>PLEKHA4</i>	ENSG00000105559	-0.99	0.0579	-17.19
<i>ZNF425</i>	ENSG00000204947	-0.79	0.0458	-17.18
<i>PTPRU</i>	ENSG00000060656	-3.57	0.2084	-17.11
<i>TRIM52</i>	ENSG00000183718	-0.53	0.0312	-17.10

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<i>DNAJC18</i>	ENSG00000170464	-0.62	0.0362	-17.07
<i>ZNF444</i>	ENSG00000167685	-0.38	0.0223	-17.04
<i>SOS2</i>	ENSG00000100485	-0.45	0.0264	-16.99
<i>IQCH-AS1</i>	ENSG00000259673	-1.19	0.0700	-16.99
<i>AC005863.1</i>	ENSG00000205325	-0.93	0.0548	-16.92
<i>ID2</i>	ENSG00000115738	-0.72	0.0429	-16.89
<i>TEN1-CDK3</i>	ENSG00000261408	-0.45	0.0266	-16.86
<i>NR2C1</i>	ENSG00000120798	-0.61	0.0364	-16.85
<i>RP11-539L10.3</i>	ENSG00000251580	-1.16	0.0689	-16.83
<i>AMER1</i>	ENSG00000184675	-0.54	0.0323	-16.76
<i>KIAA2018</i>	ENSG00000176542	-0.44	0.0265	-16.72
<i>RP11-292B8.1</i>	ENSG00000215142	-1.58	0.0946	-16.67
<i>CTSF</i>	ENSG00000174080	-1.86	0.1117	-16.62
<i>RGL2</i>	ENSG00000237441	-0.66	0.0396	-16.58
<i>ANKRD44</i>	ENSG00000065413	-1.19	0.0721	-16.55
<i>CHMP1B</i>	ENSG00000255112	-0.93	0.0560	-16.51
<i>TMEM198B</i>	ENSG00000182796	-1.08	0.0652	-16.51
<i>PCDHB11</i>	ENSG00000197479	-3.67	0.2227	-16.49
<i>GPX4</i>	ENSG00000167468	-0.48	0.0291	-16.39
<i>GAS1</i>	ENSG00000180447	-4.31	0.2628	-16.38
<i>ZBTB10</i>	ENSG00000205189	-0.69	0.0424	-16.36
<i>LENG8</i>	ENSG00000167615	-1.12	0.0687	-16.36
<i>INADL</i>	ENSG00000132849	-0.92	0.0562	-16.34
<i>ZFAND5</i>	ENSG00000107372	-0.93	0.0567	-16.31
<i>IL11RA</i>	ENSG00000137070	-0.44	0.0269	-16.30
<i>BACE1</i>	ENSG00000186318	-0.87	0.0534	-16.27
<i>BACE1</i>	ENSG00000265969	-0.70	0.0428	-16.26
<i>SYNGAP1</i>	ENSG00000197283	-0.88	0.0546	-16.19
<i>LINC00174</i>	ENSG00000179406	-1.15	0.0711	-16.17
<i>GABRE</i>	ENSG00000102287	-1.13	0.0699	-16.15
<i>ZNF30</i>	ENSG00000168661	-0.62	0.0388	-16.04
<i>LTBP2</i>	ENSG00000119681	-2.46	0.1539	-15.99
<i>RAMP1</i>	ENSG00000132329	-2.59	0.1625	-15.95
<i>UBE2F</i>	ENSG00000184182	-0.58	0.0362	-15.94
<i>RNF130</i>	ENSG00000113269	-0.88	0.0552	-15.92
<i>KIAA2026</i>	ENSG00000183354	-0.39	0.0243	-15.92
<i>HECTD4</i>	ENSG00000173064	-0.71	0.0450	-15.74
<i>GLIS2</i>	ENSG00000126603	-0.67	0.0427	-15.73
<i>RHOBTB3</i>	ENSG00000164292	-0.49	0.0313	-15.70
<i>NAMPT</i>	ENSG00000105835	-0.77	0.0492	-15.64
<i>RP4-798P15.3</i>	ENSG00000254154	-0.71	0.0456	-15.63
<i>LRP1</i>	ENSG00000123384	-1.03	0.0661	-15.63
<i>PAPSS1</i>	ENSG00000138801	-0.66	0.0422	-15.55
<i>ABR</i>	ENSG00000159842	-0.56	0.0359	-15.52
<i>TCTN1</i>	ENSG00000204852	-0.86	0.0555	-15.45
<i>TRPS1</i>	ENSG00000104447	-0.99	0.0641	-15.39

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>DIRAS1</i>	ENSG00000176490	-2.58	0.1679	-15.37
<i>ZNF345</i>	ENSG00000251247	-1.08	0.0702	-15.37
<i>LY75</i>	ENSG00000054219	-1.39	0.0907	-15.37
<i>SCUBE3</i>	ENSG00000146197	-0.96	0.0623	-15.33
<i>C1orf233</i>	ENSG00000228594	-0.51	0.0335	-15.31
<i>RP11-252A24.7</i>	ENSG00000260539	-0.88	0.0572	-15.31
<i>ARID2</i>	ENSG00000189079	-0.59	0.0387	-15.30
<i>KRT10</i>	ENSG00000186395	-0.38	0.0248	-15.30
<i>SNX9</i>	ENSG00000130340	-1.00	0.0653	-15.27
<i>ZBTB48</i>	ENSG00000204859	-0.42	0.0276	-15.24
<i>PCED1A</i>	ENSG00000132635	-0.48	0.0315	-15.24
<i>RP11-396K3.1</i>	ENSG00000233369	-1.15	0.0756	-15.22
<i>C16orf45</i>	ENSG00000166780	-0.77	0.0510	-15.19
<i>RP13-507I23.1</i>	ENSG00000235703	-1.58	0.1040	-15.19
<i>CTC-273B12.8</i>	ENSG00000269751	-0.80	0.0528	-15.09
<i>TRIM13</i>	ENSG00000204977	-0.51	0.0339	-15.06
<i>PLD2</i>	ENSG00000129219	-0.67	0.0448	-15.05
<i>ZNF529</i>	ENSG00000186020	-0.70	0.0469	-15.02
<i>TMTC4</i>	ENSG00000125247	-1.36	0.0907	-15.00
<i>SSBP3</i>	ENSG00000157216	-1.09	0.0727	-14.99
<i>TUBGCP6</i>	ENSG00000128159	-0.53	0.0353	-14.95
<i>CLDN15</i>	ENSG00000106404	-0.92	0.0618	-14.94
<i>ZNF470</i>	ENSG00000197016	-0.65	0.0436	-14.93
<i>LAMB1</i>	ENSG00000091136	-0.72	0.0484	-14.92
<i>PER3</i>	ENSG00000049246	-1.14	0.0769	-14.83
<i>ZNF184</i>	ENSG00000096654	-0.73	0.0497	-14.76
<i>ITPR2</i>	ENSG00000123104	-0.97	0.0658	-14.74
<i>ARSB</i>	ENSG00000113273	-1.01	0.0685	-14.72
<i>ADCY6</i>	ENSG00000174233	-0.56	0.0380	-14.70
<i>ZMYM6</i>	ENSG00000163867	-0.42	0.0283	-14.69
<i>GLT8D2</i>	ENSG00000120820	-1.65	0.1125	-14.66
<i>MLLT6</i>	ENSG00000108292	-0.51	0.0353	-14.54
<i>ELF1</i>	ENSG00000120690	-0.44	0.0301	-14.52
<i>EML3</i>	ENSG00000149499	-0.40	0.0279	-14.46
<i>HCFC1R1</i>	ENSG00000103145	-1.45	0.1009	-14.40
<i>RP1-261D10.2</i>	ENSG00000259146	-1.82	0.1265	-14.35
<i>DYRK1B</i>	ENSG00000105204	-0.61	0.0427	-14.35
<i>ZNF133</i>	ENSG00000125846	-0.50	0.0350	-14.20
<i>ARHGEF40</i>	ENSG00000165801	-0.86	0.0609	-14.18
<i>CAMLG</i>	ENSG00000164615	-0.60	0.0425	-14.15
<i>LY75-CD302</i>	ENSG00000248672	-1.37	0.0972	-14.04
<i>ARRDC3</i>	ENSG00000113369	-1.51	0.1078	-14.03
<i>LTBP4</i>	ENSG00000090006	-1.32	0.0945	-14.02
<i>BAG2</i>	ENSG00000112208	-0.74	0.0526	-14.01
<i>PI4KAP1</i>	ENSG00000215513	-0.77	0.0554	-13.99
<i>MVB12B</i>	ENSG00000196814	-0.87	0.0623	-13.95

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>SEPP1</i>	ENSG00000250722	-7.09	0.5079	-13.95
<i>CRY2</i>	ENSG00000121671	-0.70	0.0500	-13.95
<i>MAP3K14</i>	ENSG00000006062	-0.43	0.0307	-13.93
<i>ZNF805</i>	ENSG00000204524	-1.06	0.0758	-13.93
<i>CPD</i>	ENSG00000108582	-0.52	0.0376	-13.86
<i>NFIL3</i>	ENSG00000165030	-1.34	0.0971	-13.84
<i>CTC-203F4.1</i>	ENSG00000224186	-1.40	0.1009	-13.84
<i>SUMF1</i>	ENSG00000144455	-0.51	0.0367	-13.84
<i>KDM6B</i>	ENSG00000132510	-1.45	0.1049	-13.83
<i>TCF25</i>	ENSG00000141002	-0.43	0.0311	-13.82
<i>SCLY</i>	ENSG00000132330	-0.39	0.0284	-13.81
<i>AC007283.5</i>	ENSG00000234431	-0.68	0.0495	-13.81
<i>RP11-196G11.4</i>	ENSG00000262766	-0.85	0.0616	-13.81
<i>C3orf62</i>	ENSG00000188315	-1.10	0.0798	-13.77
<i>PHYH</i>	ENSG00000107537	-0.75	0.0547	-13.76
<i>ABCA8</i>	ENSG00000141338	-2.30	0.1676	-13.73
<i>CTD-2339L15.1</i>	ENSG00000245849	-0.78	0.0566	-13.71
<i>ZFH3</i>	ENSG00000140836	-0.66	0.0482	-13.68
<i>MARC2</i>	ENSG00000117791	-0.42	0.0307	-13.68
<i>CTC-444N24.8</i>	ENSG00000268713	-1.45	0.1057	-13.67
<i>SH3BP5-AS1</i>	ENSG00000224660	-1.35	0.0988	-13.61
<i>BAZ2B</i>	ENSG00000123636	-1.21	0.0891	-13.61
<i>RP11-469M7.1</i>	ENSG00000260006	-1.48	0.1092	-13.58
<i>AMH</i>	ENSG00000104899	-0.73	0.0537	-13.57
<i>PLEKHA7</i>	ENSG00000166689	-5.17	0.3823	-13.52
<i>PCMTD1</i>	ENSG00000168300	-1.23	0.0908	-13.51
<i>MAN2B1</i>	ENSG00000104774	-0.57	0.0419	-13.49
<i>TRPC1</i>	ENSG00000144935	-0.77	0.0571	-13.46
<i>TSHZ3</i>	ENSG00000121297	-0.45	0.0338	-13.43
<i>FAM131B</i>	ENSG00000159784	-1.58	0.1180	-13.42
<i>LUM</i>	ENSG00000139329	-1.44	0.1070	-13.41
<i>PPP3CA</i>	ENSG00000138814	-0.96	0.0713	-13.41
<i>RP11-181G12.2</i>	ENSG00000182873	-0.70	0.0524	-13.40
<i>PCDHB14</i>	ENSG00000120327	-2.62	0.1971	-13.30
<i>ST6GALNAC2</i>	ENSG00000070731	-3.19	0.2399	-13.29
<i>FAM229A</i>	ENSG00000225828	-1.34	0.1010	-13.28
<i>CUTC</i>	ENSG00000119929	-0.42	0.0316	-13.28
<i>FER1L4</i>	ENSG00000088340	-1.91	0.1443	-13.25
<i>PPP1R12B</i>	ENSG00000077157	-0.57	0.0429	-13.24
<i>PTK7</i>	ENSG00000112655	-0.66	0.0499	-13.21
<i>RUFY3</i>	ENSG00000018189	-0.83	0.0632	-13.18
<i>SPHAR</i>	ENSG00000213029	-0.59	0.0446	-13.14
<i>ZMIZ1</i>	ENSG00000108175	-0.80	0.0607	-13.14
<i>GINM1</i>	ENSG00000055211	-0.41	0.0316	-13.12
<i>LRP10</i>	ENSG00000197324	-0.44	0.0334	-13.07
<i>ZNF224</i>	ENSG00000267680	-0.59	0.0450	-13.06

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>DUSP22</i>	ENSG00000112679	-0.55	0.0420	-13.06
<i>ETS2</i>	ENSG00000157557	-0.89	0.0681	-13.03
<i>MTMR11</i>	ENSG0000014914	-0.69	0.0531	-13.02
<i>ZNF250</i>	ENSG00000196150	-0.61	0.0467	-13.02
<i>SOS1</i>	ENSG00000115904	-0.42	0.0322	-13.02
<i>RBBP6</i>	ENSG00000122257	-0.39	0.0297	-13.01
<i>ADAMTS13</i>	ENSG00000160323	-1.84	0.1419	-12.96
<i>CDK19</i>	ENSG00000155111	-0.66	0.0508	-12.92
<i>GNL1</i>	ENSG00000204590	-0.79	0.0615	-12.90
<i>PCMTD2</i>	ENSG00000203880	-0.81	0.0629	-12.90
<i>FHL1</i>	ENSG00000022267	-0.39	0.0301	-12.87
<i>ABCD4</i>	ENSG00000119688	-0.76	0.0595	-12.84
<i>CEP68</i>	ENSG00000011523	-0.71	0.0552	-12.83
<i>C5orf4</i>	ENSG00000170271	-1.80	0.1405	-12.83
<i>WWOX</i>	ENSG00000186153	-0.92	0.0716	-12.83
<i>CTD-2535L24.2</i>	ENSG00000266076	-1.05	0.0819	-12.81
<i>WDR19</i>	ENSG00000157796	-0.89	0.0697	-12.79
<i>QRICH2</i>	ENSG00000129646	-1.95	0.1526	-12.78
<i>MEGF8</i>	ENSG00000105429	-0.49	0.0387	-12.77
<i>C20orf112</i>	ENSG00000197183	-0.73	0.0571	-12.74
<i>ZNF354B</i>	ENSG00000178338	-0.47	0.0369	-12.72
<i>DMXL1</i>	ENSG00000172869	-0.38	0.0303	-12.64
<i>TMEM64</i>	ENSG00000180694	-0.72	0.0567	-12.64
<i>RNF44</i>	ENSG00000146083	-0.89	0.0706	-12.63
<i>ZNF446</i>	ENSG00000083838	-0.42	0.0330	-12.60
<i>EGR3</i>	ENSG00000179388	-2.78	0.2209	-12.59
<i>LXN</i>	ENSG00000079257	-1.45	0.1148	-12.59
<i>FZD4</i>	ENSG00000174804	-0.43	0.0341	-12.59
<i>COL4A4</i>	ENSG00000081052	-5.36	0.4262	-12.58
<i>ABLIM1</i>	ENSG00000099204	-1.65	0.1317	-12.55
<i>ALDH3A2</i>	ENSG00000072210	-1.30	0.1041	-12.53
<i>DENND6A</i>	ENSG00000174839	-0.44	0.0354	-12.51
<i>CD47</i>	ENSG00000196776	-0.44	0.0352	-12.49
<i>THRA</i>	ENSG00000126351	-0.94	0.0754	-12.49
<i>RP11-20G6.3</i>	ENSG00000260566	-0.86	0.0687	-12.47
<i>DIAPH2</i>	ENSG00000147202	-0.48	0.0385	-12.47
<i>FAM171A1</i>	ENSG00000148468	-0.50	0.0400	-12.45
<i>TMEM132D</i>	ENSG00000151952	-0.74	0.0594	-12.41
<i>KBTBD3</i>	ENSG00000182359	-0.39	0.0311	-12.40
<i>PGM2L1</i>	ENSG00000165434	-1.65	0.1331	-12.40
<i>TGFB3</i>	ENSG00000119699	-2.91	0.2352	-12.38
<i>TGFB1</i>	ENSG00000105329	-0.58	0.0469	-12.37
<i>FHDC1</i>	ENSG00000137460	-1.44	0.1169	-12.35
<i>IFT80</i>	ENSG00000068885	-0.68	0.0552	-12.27
<i>KIAA1147</i>	ENSG00000257093	-0.71	0.0578	-12.27
<i>FN1</i>	ENSG00000115414	-1.35	0.1101	-12.27

List of genes downregulated by merlin inactivation in the arachnoidal cell system as determined by Z-score in initial analyses in Y1 and Y2

<i>ZNF503</i>	ENSG00000165655	-1.69	0.1379	-12.27
<i>PER2</i>	ENSG00000132326	-2.28	0.1868	-12.21
<i>PPAP2B</i>	ENSG00000162407	-1.33	0.1092	-12.19
<i>HSF4</i>	ENSG00000102878	-1.32	0.1087	-12.17
<i>WNT9A</i>	ENSG00000143816	-2.05	0.1686	-12.14
<i>ERRFI1</i>	ENSG00000116285	-3.01	0.2480	-12.14
<i>CBFA2T2</i>	ENSG00000078699	-0.61	0.0507	-12.13
<i>MEF2D</i>	ENSG00000116604	-0.82	0.0673	-12.13
<i>HECA</i>	ENSG00000112406	-0.89	0.0736	-12.09
<i>POGZ</i>	ENSG00000143442	-0.42	0.0347	-12.08
<i>RP11-603J24.7</i>	ENSG00000237493	-0.71	0.0592	-12.08
<i>ARL5B</i>	ENSG00000165997	-0.70	0.0585	-12.08
<i>RABL5</i>	ENSG00000128581	-0.45	0.0373	-12.08
<i>IDS</i>	ENSG00000010404	-0.41	0.0341	-11.97
<i>HINT3</i>	ENSG00000111911	-0.38	0.0322	-11.96
<i>CCNI</i>	ENSG00000118816	-0.49	0.0411	-11.88
<i>CAPS2</i>	ENSG00000180881	-0.47	0.0398	-11.88
<i>EEF2K</i>	ENSG00000103319	-0.98	0.0823	-11.86
<i>ITPRIP</i>	ENSG00000148841	-0.95	0.0798	-11.86
<i>GARNL3</i>	ENSG00000136895	-1.28	0.1083	-11.86
<i>CTD-2587M2.1</i>	ENSG00000249476	-0.91	0.0769	-11.84
<i>TBC1D3</i>	ENSG00000197681	-0.82	0.0690	-11.83
<i>HDAC4</i>	ENSG00000068024	-0.66	0.0555	-11.83
<i>CHD6</i>	ENSG00000124177	-0.44	0.0371	-11.80
<i>NCOA7</i>	ENSG00000111912	-1.04	0.0883	-11.78
<i>SLC23A2</i>	ENSG00000089057	-0.63	0.0534	-11.70
<i>CTSO</i>	ENSG00000256043	-2.03	0.1732	-11.70
<i>APOE</i>	ENSG00000130203	-3.01	0.2574	-11.69
<i>RP11-448G15.3</i>	ENSG00000261490	-1.15	0.0982	-11.67
<i>PLAGL1</i>	ENSG00000118495	-0.96	0.0828	-11.66
<i>AL163636.6</i>	ENSG00000259171	-1.39	0.1198	-11.64
<i>ZNF561</i>	ENSG00000171469	-0.54	0.0464	-11.63
<i>GALT</i>	ENSG00000213930	-0.55	0.0470	-11.63
<i>EFHC1</i>	ENSG00000096093	-0.67	0.0581	-11.60
<i>NPEPL1</i>	ENSG00000215440	-0.39	0.0337	-11.60
<i>MOXD1</i>	ENSG00000079931	-0.87	0.0753	-11.59
<i>TNFRSF25</i>	ENSG00000215788	-1.11	0.0962	-11.57
<i>KLF11</i>	ENSG00000172059	-1.02	0.0883	-11.56

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

Gene Symbol	ENSEMBL ID	mean fold change	sd	Z score
<i>OSBPL1A</i>	ENSG00000141447	10.17	0.44	23.13
<i>SLC15A3</i>	ENSG00000110446	11.03	0.63	17.62
<i>COL6A2</i>	ENSG00000142173	10.46	0.60	17.34
<i>PHYHD1</i>	ENSG00000175287	8.80	0.53	16.66
<i>PARP11</i>	ENSG00000111224	6.79	0.42	16.10
<i>TCF7L1</i>	ENSG00000152284	7.60	0.47	16.05
<i>FAM127C</i>	ENSG00000212747	5.26	0.35	15.08
<i>MYH10</i>	ENSG00000133026	12.39	0.87	14.30
<i>LARGE</i>	ENSG00000133424	6.94	0.54	12.96
<i>CASP4</i>	ENSG00000196954	6.90	0.54	12.88
<i>SLC16A5</i>	ENSG00000170190	8.85	0.71	12.41
<i>MPP1</i>	ENSG00000130830	4.66	0.38	12.36
<i>TMEM98</i>	ENSG00000006042	10.66	0.88	12.05
<i>SOBP</i>	ENSG00000112320	8.95	0.76	11.82
<i>FLI1</i>	ENSG00000151702	7.76	0.67	11.56
<i>CTSH</i>	ENSG00000103811	9.25	0.80	11.53
<i>SEMA4D</i>	ENSG00000187764	10.76	0.95	11.27
<i>ADRBK2</i>	ENSG00000100077	7.51	0.69	10.87
<i>PLCG2</i>	ENSG00000197943	7.87	0.73	10.79
<i>CARD6</i>	ENSG00000132357	7.37	0.71	10.35
<i>IL1R1</i>	ENSG00000115594	8.75	0.85	10.35
<i>LONRF2</i>	ENSG00000170500	7.66	0.78	9.83
<i>STK33</i>	ENSG00000130413	6.70	0.70	9.50
<i>MFNG</i>	ENSG00000100060	7.74	0.82	9.50
<i>ARRDC4</i>	ENSG00000140450	7.42	0.78	9.49
<i>COL6A1</i>	ENSG00000142156	5.83	0.62	9.39
<i>EVI2A</i>	ENSG00000126860	8.64	0.93	9.31
<i>ARHGEF3</i>	ENSG00000163947	8.32	0.90	9.25
<i>CREG1</i>	ENSG00000143162	5.70	0.62	9.24
<i>FES</i>	ENSG00000182511	8.93	0.98	9.13
<i>XAF1</i>	ENSG00000132530	7.91	0.87	9.12
<i>SMU1</i>	ENSG00000122692	1.22	0.14	9.05
<i>KIAA1462</i>	ENSG00000165757	5.60	0.63	8.92
<i>GALM</i>	ENSG00000143891	4.88	0.55	8.85
<i>SLC41A2</i>	ENSG00000136052	5.52	0.63	8.76
<i>CD33</i>	ENSG00000105383	6.97	0.80	8.67
<i>HCP5</i>	ENSG00000206337	4.66	0.54	8.62
<i>CDO1</i>	ENSG00000129596	8.92	1.04	8.61
<i>ST3GAL6</i>	ENSG00000064225	6.21	0.74	8.42
<i>PROM2</i>	ENSG00000155066	3.51	0.42	8.41
<i>HLA-F</i>	ENSG00000204642	4.66	0.56	8.33
<i>VSTM4</i>	ENSG00000165633	9.52	1.14	8.32

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>FAM120AOS</i>	ENSG00000188938	1.96	0.24	8.22
<i>MAPRE3</i>	ENSG00000084764	3.13	0.39	8.02
<i>WWC1</i>	ENSG00000113645	7.69	0.96	8.01
<i>LYN</i>	ENSG00000254087	4.39	0.55	7.95
<i>FAM107A</i>	ENSG00000168309	10.63	1.35	7.86
<i>NLRP3</i>	ENSG00000162711	7.77	1.00	7.73
<i>ZNF630</i>	ENSG00000221994	4.04	0.52	7.73
<i>UBE2R2</i>	ENSG00000107341	1.32	0.17	7.70
<i>TP53I11</i>	ENSG00000175274	7.11	0.92	7.70
<i>ZMAT1</i>	ENSG00000166432	7.78	1.01	7.69
<i>RHOD</i>	ENSG00000173156	3.14	0.41	7.69
<i>FAM84B</i>	ENSG00000168672	6.42	0.84	7.64
<i>ACSF2</i>	ENSG00000167107	6.25	0.83	7.57
<i>OAS2</i>	ENSG00000111335	7.31	0.97	7.55
<i>FMNL3</i>	ENSG00000161791	4.76	0.63	7.53
<i>PHF2</i>	ENSG00000197724	1.70	0.23	7.51
<i>CCDC113</i>	ENSG00000103021	3.90	0.52	7.49
<i>RAB20</i>	ENSG00000139832	5.48	0.74	7.42
<i>CIITA</i>	ENSG00000179583	11.16	1.51	7.38
<i>OLFML1</i>	ENSG00000183801	11.18	1.52	7.37
<i>ZNF681</i>	ENSG00000196172	3.06	0.42	7.32
<i>IL17RD</i>	ENSG00000144730	6.91	0.95	7.32
<i>IL15RA</i>	ENSG00000134470	4.08	0.56	7.25
<i>COLEC12</i>	ENSG00000158270	12.56	1.74	7.22
<i>NUDT7</i>	ENSG00000140876	5.18	0.72	7.22
<i>FAM78A</i>	ENSG00000126882	6.75	0.95	7.13
<i>TEK</i>	ENSG00000120156	6.06	0.86	7.09
<i>GAB3</i>	ENSG00000160219	8.30	1.18	7.05
<i>LRRC8B</i>	ENSG00000197147	4.38	0.62	7.03
<i>OAS1</i>	ENSG00000089127	9.13	1.30	7.03
<i>PLXNC1</i>	ENSG00000136040	10.16	1.45	7.03
<i>DDIT4</i>	ENSG00000168209	7.48	1.08	6.94
<i>RRAGD</i>	ENSG00000025039	5.69	0.83	6.89
<i>RAVER2</i>	ENSG00000162437	5.26	0.76	6.88
<i>ZNF439</i>	ENSG00000171291	3.14	0.46	6.87
<i>TSPYL5</i>	ENSG00000180543	5.63	0.83	6.81
<i>FAM149A</i>	ENSG00000109794	6.23	0.91	6.81
<i>GCA</i>	ENSG00000115271	7.84	1.18	6.66
<i>SLC43A3</i>	ENSG00000134802	6.03	0.91	6.65
<i>FAM49A</i>	ENSG00000197872	6.18	0.94	6.61
<i>CSF1R</i>	ENSG00000182578	10.46	1.58	6.61
<i>RP11-872D17.8</i>	ENSG00000254979	5.81	0.88	6.59
<i>ZNF677</i>	ENSG00000197928	3.67	0.56	6.54
<i>NDN</i>	ENSG00000182636	11.41	1.75	6.52
<i>PGM5</i>	ENSG00000154330	10.65	1.64	6.50

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>HLA-DMB</i>	ENSG00000242574	9.64	1.48	6.50
<i>CD68</i>	ENSG00000129226	4.91	0.76	6.46
<i>LDB2</i>	ENSG00000169744	9.87	1.53	6.43
<i>FZD3</i>	ENSG00000104290	4.28	0.67	6.40
<i>NAP1L3</i>	ENSG00000186310	5.07	0.79	6.40
<i>EIF4E3</i>	ENSG00000163412	5.53	0.87	6.38
<i>MTSS1</i>	ENSG00000170873	10.62	1.67	6.37
<i>NYNRIN</i>	ENSG00000205978	8.91	1.40	6.37
<i>NFATC2</i>	ENSG00000101096	6.13	0.96	6.37
<i>STRBP</i>	ENSG00000165209	2.00	0.31	6.35
<i>FMO4</i>	ENSG00000076258	6.31	1.00	6.34
<i>HERC6</i>	ENSG00000138642	5.07	0.80	6.34
<i>MX1</i>	ENSG00000157601	6.94	1.10	6.33
<i>RTP4</i>	ENSG00000136514	4.76	0.75	6.32
<i>ZNF516</i>	ENSG00000101493	8.98	1.42	6.32
<i>AC099522.1</i>	ENSG00000183900	3.21	0.51	6.31
<i>NCKAP1L</i>	ENSG00000123338	10.93	1.74	6.30
<i>LNK1</i>	ENSG00000072201	6.06	0.96	6.29
<i>CTD-3184A7.4</i>	ENSG00000232442	3.10	0.49	6.28
<i>FAM213A</i>	ENSG00000122378	11.50	1.83	6.28
<i>HSPA12A</i>	ENSG00000165868	7.56	1.21	6.25
<i>KCNC3</i>	ENSG00000131398	11.08	1.79	6.20
<i>MAGEH1</i>	ENSG00000187601	3.71	0.60	6.20
<i>HOMER2</i>	ENSG00000103942	6.10	0.98	6.20
<i>RP11-18F14.2</i>	ENSG00000261128	5.12	0.83	6.18
<i>CLEC2B</i>	ENSG00000110852	5.65	0.92	6.17
<i>TSPAN33</i>	ENSG00000158457	4.57	0.74	6.16
<i>DNAJB2</i>	ENSG00000135924	1.63	0.27	6.14
<i>NUP210</i>	ENSG00000132182	5.25	0.86	6.12
<i>SLC18B1</i>	ENSG00000146409	3.87	0.63	6.11
<i>FOXD2</i>	ENSG00000186564	8.63	1.42	6.09
<i>FKBP5</i>	ENSG00000096060	9.12	1.50	6.08
<i>CLEC2D</i>	ENSG00000069493	4.49	0.74	6.06
<i>CPNE8</i>	ENSG00000139117	7.24	1.20	6.05
<i>SLC12A7</i>	ENSG00000113504	8.46	1.40	6.04
<i>PALD1</i>	ENSG00000107719	5.66	0.95	5.98
<i>MSRB2</i>	ENSG00000148450	2.29	0.38	5.97
<i>HIVEP3</i>	ENSG00000127124	7.08	1.19	5.96
<i>F8</i>	ENSG00000185010	4.02	0.68	5.95
<i>FOXD1</i>	ENSG00000251493	3.07	0.52	5.95
<i>ENOSF1</i>	ENSG00000132199	2.79	0.47	5.93
<i>ZNF43</i>	ENSG00000198521	2.38	0.40	5.93
<i>CORO1A</i>	ENSG00000102879	7.28	1.23	5.93
<i>TNS1</i>	ENSG00000079308	5.61	0.95	5.90
<i>SLC29A3</i>	ENSG00000198246	3.61	0.61	5.90

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>CTD-2368P22.1</i>	ENSG00000176593	3.90	0.66	5.89
<i>CLEC1A</i>	ENSG00000150048	12.57	2.14	5.88
<i>MFAP3L</i>	ENSG00000198948	4.19	0.71	5.88
<i>SRGAP3</i>	ENSG00000196220	8.29	1.41	5.87
<i>AC009469.1</i>	ENSG00000256309	6.95	1.19	5.86
<i>ZNF169</i>	ENSG00000175787	2.90	0.49	5.86
<i>HLA-DQB1</i>	ENSG00000179344	12.27	2.09	5.86
<i>FOXD2-AS1</i>	ENSG00000237424	6.36	1.09	5.86
<i>GTPBP6</i>	ENSG00000178605	1.63	0.28	5.85
<i>AC099522.2</i>	ENSG00000255883	1.74	0.30	5.84
<i>STARD8</i>	ENSG00000130052	4.29	0.73	5.84
<i>C7orf31</i>	ENSG00000153790	5.81	0.99	5.84
<i>TMEM150C</i>	ENSG00000249242	5.92	1.02	5.82
<i>HLA-DMA</i>	ENSG00000204257	6.21	1.07	5.81
<i>ZNF135</i>	ENSG00000176293	8.21	1.42	5.79
<i>SURF6</i>	ENSG00000148296	1.40	0.24	5.76
<i>CACHD1</i>	ENSG00000158966	4.10	0.71	5.75
<i>TNFRSF1B</i>	ENSG00000028137	11.62	2.02	5.75
<i>CXCR4</i>	ENSG00000121966	10.71	1.87	5.73
<i>PYGL</i>	ENSG00000100504	3.66	0.64	5.72
<i>ZNF606</i>	ENSG00000166704	2.68	0.47	5.71
<i>SPATA5L1</i>	ENSG00000171763	1.64	0.29	5.70
<i>ZFP3</i>	ENSG00000180787	3.50	0.62	5.66
<i>ZNF354C</i>	ENSG00000177932	4.99	0.89	5.61
<i>SPRY1</i>	ENSG00000164056	6.38	1.14	5.59
<i>P2RX7</i>	ENSG00000089041	5.21	0.93	5.58
<i>CXADR</i>	ENSG00000154639	9.27	1.66	5.58
<i>FAM105A</i>	ENSG00000145569	8.54	1.53	5.56
<i>HLA-C</i>	ENSG00000204525	1.83	0.33	5.55
<i>SCRN2</i>	ENSG00000141295	2.07	0.37	5.55
<i>B3GALNT1</i>	ENSG00000169255	2.99	0.54	5.55
<i>ZNF334</i>	ENSG00000198185	8.03	1.45	5.54
<i>ST6GALNAC6</i>	ENSG00000160408	1.73	0.31	5.53
<i>MAP3K5</i>	ENSG00000197442	4.39	0.79	5.53
<i>GIMAP2</i>	ENSG00000106560	6.21	1.12	5.52
<i>TMCC3</i>	ENSG00000057704	8.96	1.63	5.51
<i>GPR27</i>	ENSG00000170837	8.75	1.59	5.50
<i>GKAP1</i>	ENSG00000165113	2.56	0.46	5.50
<i>MANBA</i>	ENSG00000109323	1.40	0.25	5.49
<i>IGFLR1</i>	ENSG00000126246	3.37	0.62	5.47
<i>ITGB2</i>	ENSG00000160255	7.02	1.29	5.45
<i>SLC25A30</i>	ENSG00000174032	1.78	0.33	5.45
<i>TSPAN18</i>	ENSG00000157570	10.87	1.99	5.45
<i>LINC00654</i>	ENSG00000205181	7.56	1.39	5.45
<i>LURAP1</i>	ENSG00000171357	3.48	0.64	5.44

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<i>RTN1</i>	ENSG00000139970	6.15	1.13	5.43
<i>CEP44</i>	ENSG00000164118	1.36	0.25	5.43
<i>SERPINA1</i>	ENSG00000197249	8.05	1.48	5.42
<i>HLA-DQA1</i>	ENSG00000196735	12.51	2.31	5.42
<i>CARD16</i>	ENSG00000204397	6.44	1.19	5.41
<i>PARD6G</i>	ENSG00000178184	7.14	1.32	5.40
<i>CD163</i>	ENSG00000177575	13.11	2.44	5.38
<i>ARHGDI1B</i>	ENSG00000111348	8.07	1.51	5.36
<i>ARMCX2</i>	ENSG00000184867	4.92	0.92	5.35
<i>CCDC69</i>	ENSG00000198624	5.32	0.99	5.35
<i>LINC00526</i>	ENSG00000264575	2.32	0.43	5.34
<i>MTUS1</i>	ENSG00000129422	8.68	1.63	5.32
<i>ITIH5</i>	ENSG00000123243	10.45	1.97	5.30
<i>TMEM107</i>	ENSG00000179029	1.88	0.36	5.29
<i>CD93</i>	ENSG00000125810	13.02	2.47	5.27
<i>IRF5</i>	ENSG00000128604	5.79	1.10	5.27
<i>PPIL3</i>	ENSG00000240344	1.42	0.27	5.25
<i>GMPR</i>	ENSG00000137198	5.30	1.01	5.25
<i>SLC43A1</i>	ENSG00000149150	2.95	0.56	5.24
<i>SCAND2P</i>	ENSG00000176700	1.90	0.36	5.24
<i>HLA-B</i>	ENSG00000234745	2.41	0.46	5.23
<i>C14orf132</i>	ENSG00000227051	6.49	1.24	5.22
<i>STAB1</i>	ENSG00000010327	11.53	2.21	5.21
<i>ADORA3</i>	ENSG00000121933	11.01	2.11	5.21
<i>IFIH1</i>	ENSG00000115267	2.80	0.54	5.21
<i>RNF130</i>	ENSG00000113269	2.17	0.42	5.20
<i>FAM69B</i>	ENSG00000165716	5.69	1.09	5.20
<i>VANGL2</i>	ENSG00000162738	8.75	1.69	5.19
<i>AKAP17A</i>	ENSG00000197976	2.43	0.47	5.18
<i>AIF1</i>	ENSG00000204472	11.38	2.20	5.18
<i>HLA-DPA1</i>	ENSG00000231389	10.63	2.05	5.18
<i>ZNF138</i>	ENSG00000197008	1.52	0.29	5.18
<i>CTS2</i>	ENSG00000101160	1.88	0.36	5.17
<i>HLA-DMB</i>	ENSG00000248993	7.88	1.53	5.16
<i>SARDH</i>	ENSG00000123453	5.84	1.13	5.15
<i>ROBO4</i>	ENSG00000154133	6.68	1.30	5.15
<i>LY6E</i>	ENSG00000160932	2.85	0.55	5.15
<i>THEMIS2</i>	ENSG00000130775	6.87	1.34	5.14
<i>VWA1</i>	ENSG00000179403	5.14	1.00	5.12
<i>GTDC2</i>	ENSG00000144647	1.80	0.35	5.11
<i>TXNIP</i>	ENSG00000117289	4.55	0.89	5.10
<i>MYO1D</i>	ENSG00000176658	8.23	1.61	5.10
<i>LAIR1</i>	ENSG00000167613	12.32	2.42	5.10
<i>SIMC1</i>	ENSG00000170085	2.08	0.41	5.08
<i>WAS</i>	ENSG00000015285	7.90	1.56	5.07

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<i>C2CD2</i>	ENSG00000157617	1.90	0.38	5.05
<i>AGPAT4</i>	ENSG00000026652	2.61	0.52	5.05
<i>PLCXD1</i>	ENSG00000182378	2.66	0.53	5.05
<i>EPHB3</i>	ENSG00000182580	6.00	1.19	5.04
<i>MPZL2</i>	ENSG00000149573	11.03	2.19	5.04
<i>VSIG4</i>	ENSG00000155659	12.34	2.45	5.04
<i>SPNS2</i>	ENSG00000183018	5.27	1.05	5.04
<i>EPB41L3</i>	ENSG00000082397	10.28	2.04	5.04
<i>DCHS1</i>	ENSG00000166341	9.02	1.79	5.04
<i>RP11-708J19.1</i>	ENSG00000260236	3.08	0.61	5.03
<i>BST2</i>	ENSG00000130303	8.42	1.67	5.03
<i>SULT1A2</i>	ENSG00000197165	7.95	1.58	5.03
<i>LIFR-AS1</i>	ENSG00000244968	4.03	0.80	5.03
<i>EPHA4</i>	ENSG00000116106	3.66	0.73	5.03
<i>PPP1R3B</i>	ENSG00000173281	3.58	0.71	5.02
<i>EA2F2</i>	ENSG00000145088	3.28	0.65	5.02
<i>ABLIM3</i>	ENSG00000173210	2.61	0.52	5.00
<i>AGBL3</i>	ENSG00000146856	3.24	0.65	5.00
<i>ZNF691</i>	ENSG00000164011	2.22	0.45	4.99
<i>ASMTL-AS1</i>	ENSG00000236017	2.89	0.58	4.99
<i>TENM4</i>	ENSG00000149256	9.83	1.97	4.98
<i>IFI30</i>	ENSG00000216490	4.99	1.00	4.97
<i>RAPGEF4</i>	ENSG00000091428	7.74	1.56	4.95
<i>AC006160.8</i>	ENSG00000254360	3.08	0.62	4.95
<i>KIAA0040</i>	ENSG00000235750	7.63	1.54	4.94
<i>POC1B</i>	ENSG00000139323	1.41	0.29	4.94
<i>NET1</i>	ENSG00000173848	5.23	1.06	4.94
<i>PDZD2</i>	ENSG00000133401	5.13	1.04	4.94
<i>AL356740.1</i>	ENSG00000234603	2.38	0.48	4.93
<i>SYTL3</i>	ENSG00000164674	2.97	0.60	4.93
<i>HSD17B14</i>	ENSG00000087076	6.09	1.24	4.93
<i>KIAA0040</i>	ENSG00000265365	7.59	1.54	4.92
<i>PRKAR2B</i>	ENSG00000005249	4.79	0.97	4.92
<i>ASRGL1</i>	ENSG00000162174	3.73	0.76	4.91
<i>TSPAN14</i>	ENSG00000108219	1.73	0.35	4.91
<i>SFMBT2</i>	ENSG00000198879	9.29	1.89	4.91
<i>HLA-DOA</i>	ENSG00000204252	9.54	1.94	4.91
<i>C9orf16</i>	ENSG00000171159	1.99	0.41	4.90
<i>KHDRBS3</i>	ENSG00000131773	5.67	1.16	4.90
<i>APOBEC3G</i>	ENSG00000239713	3.39	0.69	4.90
<i>C9orf72</i>	ENSG00000147894	2.45	0.50	4.90
<i>CORO2B</i>	ENSG00000103647	5.44	1.11	4.89
<i>TBXAS1</i>	ENSG00000059377	5.74	1.17	4.89
<i>CD74</i>	ENSG00000019582	11.40	2.33	4.89
<i>GNG2</i>	ENSG00000186469	7.54	1.54	4.88

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<i>GOLGA2</i>	ENSG00000167110	1.01	0.21	4.88
<i>LYSMD2</i>	ENSG00000140280	1.90	0.39	4.88
<i>MITD1</i>	ENSG00000158411	1.57	0.32	4.88
<i>CTSS</i>	ENSG00000163131	8.87	1.82	4.87
<i>NSMCE4A</i>	ENSG00000107672	1.09	0.22	4.87
<i>SORL1</i>	ENSG00000137642	10.34	2.13	4.86
<i>RASSF4</i>	ENSG00000107551	5.92	1.22	4.86
<i>CPXM1</i>	ENSG00000088882	11.81	2.43	4.86
<i>FAM174B</i>	ENSG00000185442	5.04	1.04	4.85
<i>H1FX-AS1</i>	ENSG00000206417	3.97	0.82	4.85
<i>SERPING1</i>	ENSG00000149131	10.74	2.22	4.84
<i>ARHGAP30</i>	ENSG00000186517	9.91	2.05	4.83
<i>TOPORS-AS1</i>	ENSG00000235453	2.06	0.43	4.82
<i>NRP1</i>	ENSG00000099250	3.83	0.79	4.82
<i>GALT</i>	ENSG00000213930	2.49	0.52	4.82
<i>PTPRE</i>	ENSG00000132334	5.95	1.24	4.81
<i>RAPGEF3</i>	ENSG00000079337	5.41	1.13	4.81
<i>TLR2</i>	ENSG00000137462	11.92	2.49	4.80
<i>ERO1LB</i>	ENSG00000086619	1.91	0.40	4.80
<i>FAM117A</i>	ENSG00000121104	2.80	0.58	4.79
<i>LCP2</i>	ENSG00000043462	10.56	2.21	4.79
<i>CSF3R</i>	ENSG00000119535	11.15	2.33	4.78
<i>SH3TC1</i>	ENSG00000125089	11.35	2.37	4.78
<i>MS4A6A</i>	ENSG00000110077	11.59	2.43	4.77
<i>MXRA5</i>	ENSG00000101825	9.51	1.99	4.77
<i>SLA</i>	ENSG00000155926	10.36	2.17	4.77
<i>TSR2</i>	ENSG00000158526	1.14	0.24	4.77
<i>DDX58</i>	ENSG00000107201	1.92	0.40	4.77
<i>FAAH</i>	ENSG00000117480	5.39	1.13	4.76
<i>CD4</i>	ENSG00000010610	11.66	2.45	4.76
<i>C7orf63</i>	ENSG00000105792	4.23	0.89	4.76
<i>MGAT4A</i>	ENSG00000071073	9.03	1.90	4.75
<i>RTN4RL1</i>	ENSG00000185924	7.50	1.58	4.75
<i>NTN1</i>	ENSG00000065320	9.69	2.05	4.73
<i>TIGD7</i>	ENSG00000140993	2.12	0.45	4.73
<i>CXCL12</i>	ENSG00000107562	4.28	0.91	4.73
<i>RPS6KA1</i>	ENSG00000117676	3.17	0.67	4.73
<i>ECHDC2</i>	ENSG00000121310	2.78	0.59	4.72
<i>FAM198A</i>	ENSG00000144649	11.01	2.33	4.72
<i>SERPINF1</i>	ENSG00000132386	11.61	2.46	4.72
<i>COPG2</i>	ENSG00000158623	1.29	0.27	4.71
<i>FCGR3A</i>	ENSG00000203747	11.24	2.39	4.71
<i>ZNF680</i>	ENSG00000173041	2.24	0.48	4.71
<i>GREB1</i>	ENSG00000196208	8.39	1.78	4.71
<i>ANGPTL2</i>	ENSG00000136859	5.17	1.10	4.70

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<i>PLXDC1</i>	ENSG00000161381	9.00	1.91	4.70
<i>HTRA2</i>	ENSG00000115317	1.40	0.30	4.70
<i>C1QA</i>	ENSG00000173372	12.22	2.60	4.70
<i>HESX1</i>	ENSG00000163666	3.00	0.64	4.70
<i>KCNMB3</i>	ENSG00000171121	3.53	0.75	4.70
<i>NTRK3</i>	ENSG00000140538	10.68	2.28	4.69
<i>FAM66C</i>	ENSG00000226711	2.27	0.48	4.69
<i>UBAP1</i>	ENSG00000165006	1.24	0.26	4.69
<i>AS3MT</i>	ENSG00000214435	5.07	1.08	4.68
<i>KLRAP1</i>	ENSG00000256667	2.20	0.47	4.67
<i>WASH4P</i>	ENSG00000234769	2.64	0.57	4.67
<i>XXbac-BPG246D15.8</i>	ENSG00000204261	2.39	0.51	4.66
<i>CDH1</i>	ENSG00000039068	10.72	2.30	4.66
<i>EPSTI1</i>	ENSG00000133106	2.93	0.63	4.65
<i>SLC1A3</i>	ENSG00000079215	11.51	2.48	4.65
<i>C8orf42</i>	ENSG00000180190	8.28	1.78	4.64
<i>AKNA</i>	ENSG00000106948	4.04	0.87	4.64
<i>ANXA3</i>	ENSG00000138772	4.57	0.98	4.64
<i>CREBZF</i>	ENSG00000137504	1.63	0.35	4.63
<i>MDH1B</i>	ENSG00000138400	3.97	0.86	4.63
<i>SPEF2</i>	ENSG00000152582	4.27	0.92	4.63
<i>AEBP1</i>	ENSG00000106624	4.95	1.07	4.63
<i>OLFML2B</i>	ENSG00000162745	5.64	1.22	4.63
<i>HLA-DRA</i>	ENSG00000204287	11.07	2.40	4.62
<i>DOCK2</i>	ENSG00000134516	3.43	0.74	4.62
<i>A2M</i>	ENSG00000175899	10.64	2.31	4.61
<i>C1QC</i>	ENSG00000159189	11.24	2.44	4.61
<i>AARS2</i>	ENSG00000124608	1.45	0.31	4.60
<i>INPP5D</i>	ENSG00000168918	8.00	1.74	4.60
<i>PSMB9</i>	ENSG00000240065	2.49	0.54	4.60
<i>FUNDC2</i>	ENSG00000165775	1.28	0.28	4.59
<i>ZNF626</i>	ENSG00000188171	2.02	0.44	4.59
<i>APIP</i>	ENSG00000149089	1.37	0.30	4.59
<i>C1QB</i>	ENSG00000173369	11.96	2.61	4.59
<i>FAHD2A</i>	ENSG00000115042	1.00	0.22	4.58
<i>ENOX1</i>	ENSG00000120658	4.15	0.91	4.57
<i>HDHD2</i>	ENSG00000167220	1.48	0.33	4.56
<i>NLRP1</i>	ENSG00000091592	2.08	0.46	4.56
<i>AKR1C3</i>	ENSG00000196139	5.39	1.18	4.55
<i>SORBS1</i>	ENSG00000095637	6.97	1.53	4.55
<i>DMKN</i>	ENSG00000161249	8.94	1.97	4.55
<i>FGD2</i>	ENSG00000146192	9.91	2.18	4.55
<i>USP18</i>	ENSG00000184979	2.40	0.53	4.55
<i>LAPTM5</i>	ENSG00000162511	10.71	2.36	4.54
<i>DAPK2</i>	ENSG00000035664	6.19	1.36	4.54

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>ZNRD1-AS1</i>	ENSG00000204623	2.43	0.54	4.53
<i>COX18</i>	ENSG00000163626	1.14	0.25	4.53
<i>RNASEH2C</i>	ENSG00000172922	1.60	0.35	4.53
<i>ADAM23</i>	ENSG00000114948	5.45	1.21	4.51
<i>CDH23</i>	ENSG00000107736	11.29	2.51	4.49
<i>USP51</i>	ENSG00000247746	4.04	0.90	4.48
<i>N6AMT2</i>	ENSG00000150456	1.21	0.27	4.48
<i>FAM162A</i>	ENSG00000114023	1.41	0.32	4.48
<i>HCLS1</i>	ENSG00000180353	10.13	2.26	4.47
<i>OLFM2</i>	ENSG00000105088	6.60	1.48	4.47
<i>C3</i>	ENSG00000125730	10.92	2.45	4.47
<i>SHANK3</i>	ENSG00000251322	5.08	1.14	4.47
<i>ZNF204P</i>	ENSG00000204789	7.01	1.57	4.46
<i>CLYBL</i>	ENSG00000125246	3.14	0.70	4.46
<i>CCDC74A</i>	ENSG00000163040	4.91	1.10	4.45
<i>ZNF671</i>	ENSG00000083814	2.31	0.52	4.45
<i>USF2</i>	ENSG00000105698	1.66	0.37	4.45
<i>LRFN1</i>	ENSG00000128011	4.26	0.96	4.45
<i>ADAM28</i>	ENSG00000042980	9.34	2.10	4.44
<i>RNASET2</i>	ENSG00000026297	4.76	1.07	4.44
<i>RAB9B</i>	ENSG00000123570	3.34	0.75	4.44
<i>CCDC8</i>	ENSG00000169515	9.31	2.10	4.44
<i>FCGBP</i>	ENSG00000090920	11.53	2.61	4.43
<i>KLHL3</i>	ENSG00000146021	7.93	1.79	4.43
<i>ATP8A1</i>	ENSG00000124406	6.13	1.38	4.43
<i>SLC37A2</i>	ENSG00000134955	5.89	1.33	4.43
<i>GM2A</i>	ENSG00000196743	1.40	0.32	4.42
<i>RP11-727A23.5</i>	ENSG00000247137	3.15	0.71	4.42
<i>BHMT2</i>	ENSG00000132840	5.38	1.22	4.42
<i>HLA-DRB5</i>	ENSG00000198502	11.06	2.51	4.41
<i>SLC15A2</i>	ENSG00000163406	7.52	1.71	4.40
<i>RAD9A</i>	ENSG00000172613	1.71	0.39	4.40
<i>OAF</i>	ENSG00000184232	5.36	1.22	4.40
<i>TOP1</i>	ENSG00000198900	1.50	0.34	4.39
<i>GPR160</i>	ENSG00000173890	2.63	0.60	4.38
<i>SEC24B-AS1</i>	ENSG00000247950	2.60	0.59	4.38
<i>CHST10</i>	ENSG00000115526	1.45	0.33	4.38
<i>ICAM1</i>	ENSG00000090339	5.37	1.23	4.37
<i>CLEC11A</i>	ENSG00000105472	6.33	1.45	4.37
<i>LRPAP1</i>	ENSG00000163956	1.06	0.24	4.37
<i>MIR600HG</i>	ENSG00000236901	4.42	1.01	4.37
<i>NAPB</i>	ENSG00000125814	1.68	0.38	4.36
<i>LIFR</i>	ENSG00000113594	3.32	0.76	4.36
<i>PHF7</i>	ENSG00000010318	1.25	0.29	4.36
<i>HLA-DPB1</i>	ENSG00000223865	10.89	2.50	4.35

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<i>MS4A7</i>	ENSG00000166927	9.91	2.28	4.35
<i>SLC25A35</i>	ENSG00000125434	2.02	0.47	4.35
<i>SLC25A6</i>	ENSG00000169100	1.63	0.38	4.35
<i>RP11-213G2.3</i>	ENSG00000165121	2.23	0.51	4.34
<i>CIZ1</i>	ENSG00000148337	1.18	0.27	4.34
<i>RP11-383H13.1</i>	ENSG00000235531	4.41	1.02	4.34
<i>POLN</i>	ENSG00000130997	1.78	0.41	4.33
<i>THBS4</i>	ENSG00000113296	4.34	1.00	4.32
<i>RP11-315D16.2</i>	ENSG00000260007	4.38	1.01	4.32
<i>ACSS3</i>	ENSG00000111058	7.51	1.74	4.32
<i>FRS3</i>	ENSG00000137218	1.91	0.44	4.32
<i>TMEM220</i>	ENSG00000187824	5.18	1.20	4.32
<i>BHLHE41</i>	ENSG00000123095	5.56	1.29	4.32
<i>ADPGK</i>	ENSG00000159322	1.03	0.24	4.31
<i>OARD1</i>	ENSG00000124596	1.47	0.34	4.31
<i>SRSF12</i>	ENSG00000154548	5.49	1.27	4.30
<i>TMEM100</i>	ENSG00000166292	11.71	2.72	4.30
<i>CCNO</i>	ENSG00000152669	2.34	0.54	4.30
<i>NXNL2</i>	ENSG00000130045	4.17	0.97	4.29
<i>MBNL3</i>	ENSG00000076770	9.25	2.16	4.29
<i>CEBPA</i>	ENSG00000245848	5.34	1.25	4.29
<i>ANKRD23</i>	ENSG00000163126	1.20	0.28	4.28
<i>AC008738.1</i>	ENSG00000230259	5.31	1.24	4.28
<i>SLC7A8</i>	ENSG00000092068	9.95	2.33	4.28
<i>ESAM</i>	ENSG00000149564	6.50	1.52	4.28
<i>MCTP1</i>	ENSG00000175471	3.88	0.91	4.27
<i>LSR</i>	ENSG00000105699	5.28	1.24	4.27
<i>TM6SF1</i>	ENSG00000136404	8.95	2.10	4.26
<i>METTL7A</i>	ENSG00000185432	7.89	1.85	4.26
<i>CYP27A1</i>	ENSG00000135929	10.02	2.35	4.26
<i>CDH5</i>	ENSG00000179776	9.85	2.31	4.26
<i>SIGLEC10</i>	ENSG00000142512	9.66	2.27	4.25
<i>WNK4</i>	ENSG00000126562	8.64	2.04	4.25
<i>PPWD1</i>	ENSG00000113593	1.06	0.25	4.24
<i>IRF2</i>	ENSG00000168310	1.45	0.34	4.24
<i>DCAF12</i>	ENSG00000198876	1.39	0.33	4.24
<i>EPB41L4A</i>	ENSG00000129595	7.84	1.85	4.23
<i>TNFSF12</i>	ENSG00000239697	2.53	0.60	4.23
<i>GATM</i>	ENSG00000171766	8.00	1.89	4.23
<i>GSDMD</i>	ENSG00000104518	1.77	0.42	4.23
<i>HLA-DRB1</i>	ENSG00000196126	11.27	2.67	4.23
<i>RASSF2</i>	ENSG00000101265	10.80	2.56	4.23
<i>ATG16L2</i>	ENSG00000168010	2.69	0.64	4.22
<i>CCDC66</i>	ENSG00000180376	1.43	0.34	4.22
<i>C9orf37</i>	ENSG00000203993	1.79	0.42	4.22

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<i>ENG</i>	ENSG00000106991	2.49	0.59	4.22
<i>FBXO4</i>	ENSG00000151876	1.28	0.30	4.22
<i>C19orf66</i>	ENSG00000130813	2.15	0.51	4.21
<i>PREX1</i>	ENSG00000124126	4.87	1.16	4.21
<i>CDADC1</i>	ENSG00000102543	1.34	0.32	4.21
<i>OSBPL3</i>	ENSG00000070882	2.71	0.64	4.20
<i>RGS1</i>	ENSG00000090104	10.56	2.51	4.20
<i>RP11-231E4.4</i>	ENSG00000264247	1.75	0.42	4.20
<i>C2orf40</i>	ENSG00000119147	11.30	2.69	4.20
<i>ACOX2</i>	ENSG00000168306	2.04	0.49	4.19
<i>B3GNT1</i>	ENSG00000174684	1.97	0.47	4.19
<i>POU2F2</i>	ENSG00000028277	5.70	1.36	4.19
<i>VASH1</i>	ENSG00000071246	3.58	0.85	4.19
<i>NTRK2</i>	ENSG00000148053	9.33	2.23	4.19
<i>SREBF1</i>	ENSG00000072310	2.41	0.58	4.19
<i>CYP4V2</i>	ENSG00000145476	2.89	0.69	4.19
<i>FBXO6</i>	ENSG00000116663	2.35	0.56	4.19
<i>ARHGEF6</i>	ENSG00000129675	2.93	0.70	4.18
<i>AGXT2L2</i>	ENSG00000175309	1.87	0.45	4.17
<i>PLEKHG1</i>	ENSG00000120278	6.39	1.53	4.17
<i>AFAP1L2</i>	ENSG00000169129	6.11	1.47	4.16
<i>NEB</i>	ENSG00000183091	7.04	1.69	4.16
<i>ABCC9</i>	ENSG00000069431	10.00	2.40	4.16
<i>RP11-333E1.1</i>	ENSG00000261879	3.39	0.82	4.16
<i>DICER1-AS1</i>	ENSG00000235706	4.10	0.99	4.16
<i>ITGAX</i>	ENSG00000140678	9.91	2.39	4.15
<i>EYA1</i>	ENSG00000104313	9.97	2.41	4.15
<i>ITGAM</i>	ENSG00000169896	9.03	2.18	4.14
<i>ZNF767</i>	ENSG00000133624	2.55	0.62	4.14
<i>CCND2</i>	ENSG00000118971	9.64	2.33	4.14
<i>SPARCL1</i>	ENSG00000152583	10.19	2.46	4.14
<i>FBXL14</i>	ENSG00000171823	2.05	0.50	4.14
<i>TTYH2</i>	ENSG00000141540	5.96	1.44	4.13
<i>CARD8</i>	ENSG00000105483	1.93	0.47	4.12
<i>RP11-488C13.7</i>	ENSG00000258610	4.17	1.01	4.12
<i>FAM221A</i>	ENSG00000188732	5.63	1.37	4.12
<i>ITM2A</i>	ENSG00000078596	9.97	2.42	4.12
<i>PRMT10</i>	ENSG00000164169	1.38	0.34	4.12
<i>RP11-856B14.1</i>	ENSG00000260233	3.43	0.83	4.11
<i>CPXM2</i>	ENSG00000121898	11.13	2.71	4.11
<i>CACNA2D2</i>	ENSG00000007402	8.89	2.16	4.11
<i>APT-X</i>	ENSG00000137074	1.26	0.31	4.11
<i>TSSK6</i>	ENSG00000178093	2.04	0.50	4.11
<i>THUMPD2</i>	ENSG00000138050	1.08	0.26	4.11
<i>TYROBP</i>	ENSG00000011600	11.31	2.75	4.11

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<i>F13A1</i>	ENSG00000124491	10.36	2.52	4.11
<i>CDAN1</i>	ENSG00000140326	1.30	0.32	4.10
<i>PTGES2</i>	ENSG00000148334	1.12	0.27	4.10
<i>AL133458.1</i>	ENSG00000197146	6.64	1.62	4.09
<i>NT5M</i>	ENSG00000205309	2.98	0.73	4.09
<i>CTB-131B5.4</i>	ENSG00000245146	1.96	0.48	4.09
<i>APOBR</i>	ENSG00000184730	7.11	1.74	4.09
<i>RP11-705C15.2</i>	ENSG00000256594	2.30	0.56	4.09
<i>CD34</i>	ENSG00000174059	6.30	1.54	4.09
<i>SOX13</i>	ENSG00000143842	3.29	0.81	4.08
<i>HEBP1</i>	ENSG00000013583	1.15	0.28	4.08
<i>NUDT6</i>	ENSG00000170917	1.53	0.38	4.08
<i>ZNF540</i>	ENSG00000171817	5.16	1.27	4.08
<i>ENPP2</i>	ENSG00000136960	4.77	1.17	4.07
<i>RP11-203J24.9</i>	ENSG00000257524	2.02	0.50	4.07
<i>GIMAP5</i>	ENSG00000196329	7.66	1.88	4.07
<i>RP11-514O12.4</i>	ENSG00000249141	3.98	0.98	4.07
<i>C1orf162</i>	ENSG00000143110	6.77	1.67	4.06
<i>SEPT4</i>	ENSG00000108387	5.66	1.40	4.05
<i>ITFG2</i>	ENSG00000111203	1.35	0.33	4.05
<i>BEND7</i>	ENSG00000165626	2.67	0.66	4.05
<i>ACAP1</i>	ENSG00000072818	4.66	1.15	4.05
<i>TMEM68</i>	ENSG00000167904	1.43	0.35	4.05
<i>AQP1</i>	ENSG00000240583	10.01	2.47	4.05
<i>KIAA1467</i>	ENSG00000084444	2.14	0.53	4.05
<i>RP11-325D5.3</i>	ENSG00000248421	1.34	0.33	4.04
<i>SASH3</i>	ENSG00000122122	8.54	2.12	4.04
<i>KCNJ2</i>	ENSG00000123700	5.61	1.39	4.03
<i>AC132217.4</i>	ENSG00000240801	11.11	2.75	4.03
<i>ABAT</i>	ENSG00000183044	4.35	1.08	4.03
<i>PDE6A</i>	ENSG00000132915	6.69	1.66	4.03
<i>ACSL5</i>	ENSG00000197142	6.39	1.59	4.02
<i>PDE7A</i>	ENSG00000205268	2.09	0.52	4.02
<i>LETMD1</i>	ENSG00000050426	1.77	0.44	4.01
<i>TIE1</i>	ENSG00000066056	6.02	1.50	4.01
<i>SLC11A2</i>	ENSG00000110911	1.26	0.31	4.01
<i>ZNF594</i>	ENSG00000180626	2.71	0.68	4.00
<i>NFATC4</i>	ENSG00000100968	3.48	0.87	4.00
<i>ADAMTSL4</i>	ENSG00000143382	5.34	1.33	4.00
<i>TMEM56</i>	ENSG00000152078	2.81	0.70	4.00
<i>HMHA1</i>	ENSG00000180448	8.12	2.03	4.00
<i>DPP7</i>	ENSG00000176978	1.83	0.46	3.99
<i>RNPC3</i>	ENSG00000185946	2.72	0.68	3.99
<i>ENGASE</i>	ENSG00000167280	2.42	0.61	3.99
<i>ZNF595</i>	ENSG00000197701	1.51	0.38	3.98

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<i>MPEG1</i>	ENSG00000197629	10.66	2.68	3.98
<i>LCP1</i>	ENSG00000136167	9.66	2.43	3.98
<i>FRAS1</i>	ENSG00000138759	8.33	2.10	3.97
<i>RILPL2</i>	ENSG00000150977	1.75	0.44	3.97
<i>TRIM68</i>	ENSG00000167333	1.17	0.29	3.97
<i>SNTA1</i>	ENSG00000101400	2.34	0.59	3.97
<i>MYO1F</i>	ENSG00000142347	6.95	1.75	3.97
<i>NPL</i>	ENSG00000135838	4.10	1.03	3.97
<i>ZSCAN18</i>	ENSG00000121413	4.66	1.17	3.97
<i>LAMB3</i>	ENSG00000196878	2.63	0.66	3.97
<i>GUCY1B3</i>	ENSG00000061918	3.50	0.88	3.96
<i>CCDC88C</i>	ENSG00000015133	3.47	0.88	3.96
<i>SDCBP2</i>	ENSG00000125775	2.60	0.66	3.95
<i>RFX1</i>	ENSG00000132005	1.79	0.45	3.95
<i>RP11-323F5.2</i>	ENSG00000247708	1.53	0.39	3.95
<i>PIK3AP1</i>	ENSG00000155629	7.75	1.96	3.94
<i>H19</i>	ENSG00000130600	10.57	2.68	3.94
<i>TNFSF12-TNFSF13</i>	ENSG00000248871	3.19	0.81	3.94
<i>ZNF675</i>	ENSG00000197372	1.41	0.36	3.94
<i>ATL2</i>	ENSG00000119787	2.32	0.59	3.94
<i>SLC7A2</i>	ENSG00000003989	7.38	1.88	3.94
<i>SEMA4C</i>	ENSG00000168758	1.94	0.49	3.93
<i>COL5A3</i>	ENSG00000080573	4.21	1.07	3.93
<i>CYB561</i>	ENSG00000008283	2.60	0.66	3.93
<i>CYBA</i>	ENSG00000051523	7.65	1.95	3.93
<i>ZNF572</i>	ENSG00000180938	3.34	0.85	3.92
<i>CASP1</i>	ENSG00000137752	3.99	1.02	3.91
<i>PTPRC</i>	ENSG00000081237	7.53	1.92	3.91
<i>KLF9</i>	ENSG00000119138	5.70	1.46	3.91
<i>TMEM132C</i>	ENSG00000181234	10.02	2.56	3.91
<i>AMY2B</i>	ENSG00000240038	4.16	1.07	3.91
<i>EFNB1</i>	ENSG00000090776	3.88	0.99	3.90
<i>RARRES2</i>	ENSG00000106538	10.64	2.72	3.90
<i>OGN</i>	ENSG00000106809	10.56	2.71	3.90
<i>NSUN5P1</i>	ENSG00000223705	2.29	0.59	3.90
<i>CD72</i>	ENSG00000137101	4.27	1.09	3.90
<i>ADRBK1</i>	ENSG00000173020	1.64	0.42	3.89
<i>C1orf213</i>	ENSG00000249087	2.93	0.75	3.89
<i>SEPT1</i>	ENSG00000180096	2.35	0.60	3.89
<i>MPP2</i>	ENSG00000108852	1.62	0.42	3.89
<i>HLA-E</i>	ENSG00000204592	1.83	0.47	3.89
<i>CLUHP3</i>	ENSG00000131797	2.43	0.63	3.88
<i>RUSC1-AS1</i>	ENSG00000225855	2.98	0.77	3.88
<i>FREM1</i>	ENSG00000164946	9.15	2.36	3.88
<i>Z95704.2</i>	ENSG00000255436	1.60	0.41	3.88

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<i>SOD3</i>	ENSG00000109610	6.76	1.74	3.88
<i>FMOD</i>	ENSG00000122176	10.51	2.71	3.88
<i>TMEM140</i>	ENSG00000146859	2.78	0.72	3.87
<i>HSPA7</i>	ENSG00000225217	9.07	2.34	3.87
<i>LRRC37B</i>	ENSG00000185158	1.23	0.32	3.87
<i>TSPAN7</i>	ENSG00000156298	10.32	2.66	3.87
<i>GPR4</i>	ENSG00000177464	8.86	2.29	3.87
<i>RAMP2</i>	ENSG00000131477	6.66	1.72	3.87
<i>IGF2</i>	ENSG00000167244	10.42	2.70	3.87
<i>LPCAT2</i>	ENSG00000087253	3.52	0.91	3.86
<i>AK1</i>	ENSG00000106992	2.05	0.53	3.86
<i>MYO7A</i>	ENSG00000137474	7.71	2.00	3.86
<i>U2AF1L4</i>	ENSG00000267120	1.92	0.50	3.86
<i>CHST12</i>	ENSG00000136213	1.44	0.37	3.86
<i>ASB13</i>	ENSG00000196372	2.09	0.54	3.86
<i>RP11-1114A5.4</i>	ENSG00000232611	3.21	0.83	3.85
<i>AC017099.3</i>	ENSG00000228486	3.06	0.79	3.85
<i>NSUN6</i>	ENSG00000241058	1.61	0.42	3.85
<i>TMEM101</i>	ENSG00000091947	1.25	0.33	3.85
<i>ALOX5AP</i>	ENSG00000132965	8.95	2.33	3.85
<i>GID4</i>	ENSG00000141034	1.25	0.33	3.85
<i>BEX4</i>	ENSG00000102409	6.98	1.81	3.85
<i>UNC50</i>	ENSG00000115446	1.02	0.27	3.85
<i>VAT1L</i>	ENSG00000171724	10.21	2.66	3.84
<i>CLK2</i>	ENSG00000176444	1.59	0.41	3.84
<i>ITIH2</i>	ENSG00000151655	10.95	2.85	3.84
<i>PLXDC2</i>	ENSG00000120594	10.00	2.61	3.84
<i>ZNF253</i>	ENSG00000256771	2.06	0.54	3.84
<i>POPDC2</i>	ENSG00000121577	3.55	0.93	3.84
<i>SMOC2</i>	ENSG00000112562	10.29	2.69	3.83
<i>AKR1B1</i>	ENSG00000085662	1.27	0.33	3.83
<i>SLC2A5</i>	ENSG00000142583	7.10	1.86	3.83
<i>EFEMP1</i>	ENSG00000115380	4.29	1.12	3.83
<i>SH3BP5</i>	ENSG00000131370	3.47	0.91	3.83
<i>CTD-2201E18.3</i>	ENSG00000177738	1.92	0.50	3.82
<i>KREMEN1</i>	ENSG00000183762	1.62	0.42	3.82
<i>ADAM33</i>	ENSG00000149451	8.92	2.33	3.82
<i>ZNF185</i>	ENSG00000147394	4.39	1.15	3.82
<i>C7</i>	ENSG00000112936	9.52	2.49	3.82
<i>C12orf65</i>	ENSG00000130921	1.29	0.34	3.82
<i>RCSD1</i>	ENSG00000198771	9.83	2.58	3.81
<i>RP11-390P2.4</i>	ENSG00000225177	4.32	1.13	3.81
<i>PLAC9</i>	ENSG00000189129	5.66	1.49	3.81
<i>PEX11A</i>	ENSG00000166821	1.74	0.46	3.80
<i>ZNF273</i>	ENSG00000198039	3.09	0.81	3.80

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<i>ZNF692</i>	ENSG00000171163	1.71	0.45	3.80
<i>TMEM229B</i>	ENSG00000198133	3.93	1.03	3.80
<i>RAB24</i>	ENSG00000169228	1.62	0.43	3.80
<i>LAMA4</i>	ENSG00000112769	7.76	2.04	3.80
<i>FAM86C2P</i>	ENSG00000160172	1.97	0.52	3.80
<i>HDHD3</i>	ENSG00000119431	1.61	0.42	3.80
<i>ZSCAN12</i>	ENSG00000158691	1.82	0.48	3.79
<i>RP11-152N13.11</i>	ENSG00000249376	1.43	0.38	3.79
<i>CCDC102B</i>	ENSG00000150636	3.01	0.79	3.79
<i>TFEC</i>	ENSG00000105967	5.48	1.45	3.79
<i>IFIT1</i>	ENSG00000185745	2.07	0.55	3.78
<i>MYZAP</i>	ENSG00000263155	4.47	1.18	3.78
<i>CD14</i>	ENSG00000170458	7.82	2.07	3.78
<i>C10orf68</i>	ENSG00000150076	2.02	0.53	3.78
<i>PCSK5</i>	ENSG00000099139	5.86	1.55	3.78
<i>NFKBIA</i>	ENSG00000100906	2.92	0.77	3.78
<i>CHN1</i>	ENSG00000128656	3.31	0.88	3.78
<i>RP11-244O19.1</i>	ENSG00000261534	2.50	0.66	3.78
<i>CYTH4</i>	ENSG00000100055	8.70	2.30	3.77
<i>GGT5</i>	ENSG00000099998	7.08	1.87	3.77
<i>CTD-2528L19.6</i>	ENSG00000267152	2.31	0.61	3.77
<i>PECR</i>	ENSG00000115425	1.41	0.38	3.77
<i>SRGN</i>	ENSG00000122862	1.41	0.38	3.76
<i>ZRSR2</i>	ENSG00000169249	1.56	0.41	3.76
<i>USF1</i>	ENSG00000158773	1.53	0.41	3.76
<i>WHAMMP2</i>	ENSG00000248334	2.28	0.61	3.76
<i>AQP1</i>	ENSG00000250424	9.43	2.51	3.76
<i>SLIT2</i>	ENSG00000145147	6.45	1.72	3.75
<i>KIAA1324L</i>	ENSG00000164659	9.13	2.43	3.75
<i>TYMP</i>	ENSG00000025708	8.06	2.15	3.75
<i>WASH2P</i>	ENSG00000146556	2.55	0.68	3.75
<i>UQCC</i>	ENSG00000101019	1.28	0.34	3.75
<i>LUC7L3</i>	ENSG00000108848	1.75	0.47	3.75
<i>ZRSR1</i>	ENSG00000212643	1.40	0.37	3.75
<i>MAST4</i>	ENSG00000069020	3.14	0.84	3.75
<i>CFI</i>	ENSG00000205403	11.20	2.99	3.75
<i>TMEM79</i>	ENSG00000163472	1.83	0.49	3.74
<i>ZNF274</i>	ENSG00000171606	2.26	0.60	3.74
<i>SALL4</i>	ENSG00000101115	6.66	1.78	3.74
<i>ELMO1</i>	ENSG00000155849	6.25	1.67	3.74
<i>REEP1</i>	ENSG00000068615	6.75	1.81	3.74
<i>CTD-2527I21.4</i>	ENSG00000221857	10.71	2.87	3.74
<i>LMBR1L</i>	ENSG00000139636	2.13	0.57	3.73
<i>FXYP1</i>	ENSG00000266964	10.73	2.88	3.73
<i>SDHAF1</i>	ENSG00000205138	1.56	0.42	3.73

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AAAS	ENSG00000094914	1.14	0.31	3.73
PCSK7	ENSG00000160613	1.02	0.27	3.73
ANKZF1	ENSG00000163516	1.61	0.43	3.73
IGIP	ENSG00000182700	2.38	0.64	3.73
CECR1	ENSG00000093072	8.74	2.35	3.73
FAM134B	ENSG00000154153	6.10	1.64	3.73
QPRT	ENSG00000103485	9.10	2.45	3.72
RNF122	ENSG00000133874	2.59	0.70	3.72
INTS6-AS1	ENSG00000236778	2.59	0.70	3.72
RP11-64P12.8	ENSG00000217576	1.60	0.43	3.71
KCNAB3	ENSG00000170049	2.23	0.60	3.71
ELMOD3	ENSG00000115459	1.49	0.40	3.71
LL0XNC01-7P3.1	ENSG00000270012	2.49	0.67	3.71
PINK1	ENSG00000158828	1.09	0.29	3.71
ADCY7	ENSG00000121281	2.71	0.73	3.70
PPARGC1B	ENSG00000155846	2.73	0.74	3.70
CLEC7A	ENSG00000172243	10.47	2.83	3.70
DAAM2	ENSG00000146122	5.20	1.41	3.69
GPSM3	ENSG00000213654	4.05	1.10	3.69
ZNF467	ENSG00000181444	7.00	1.90	3.69
FOXRED1	ENSG00000110074	1.24	0.34	3.69
INS-IGF2	ENSG00000129965	9.86	2.67	3.69
PTER	ENSG00000165983	3.21	0.87	3.69
FMO2	ENSG00000094963	9.79	2.66	3.69
GMFG	ENSG00000130755	6.52	1.77	3.69
LINC00847	ENSG00000245060	2.30	0.62	3.68
FCER1G	ENSG00000158869	7.56	2.05	3.68
CALCOCO2	ENSG00000136436	1.29	0.35	3.68
C5orf54	ENSG00000221886	2.16	0.59	3.68
FANK1	ENSG00000203780	3.06	0.83	3.67
HLA-DRB6	ENSG00000229391	10.43	2.84	3.67
SNCAIP	ENSG00000064692	5.48	1.49	3.67
RORA	ENSG00000069667	3.48	0.95	3.67
GEMIN8	ENSG00000046647	1.06	0.29	3.66
OGFR	ENSG00000060491	1.53	0.42	3.66
LYZ	ENSG00000090382	9.00	2.46	3.66
DHRS7B	ENSG00000109016	1.25	0.34	3.66
WDR52	ENSG00000206530	2.32	0.63	3.66
RP13-942N8.1	ENSG00000256092	2.36	0.64	3.66
MERTK	ENSG00000153208	3.96	1.08	3.66
NDRG2	ENSG00000165795	5.55	1.52	3.66
ZIK1	ENSG00000171649	2.05	0.56	3.66
FYB	ENSG00000082074	9.45	2.58	3.66
CCBL1	ENSG00000171097	1.48	0.40	3.66
C2orf81	ENSG00000159239	3.23	0.88	3.66

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<i>CRABP1</i>	ENSG00000166426	10.71	2.93	3.65
<i>THBS2</i>	ENSG00000186340	5.96	1.63	3.65
<i>LST1</i>	ENSG00000204482	7.23	1.98	3.65
<i>HIC1</i>	ENSG00000177374	3.24	0.89	3.65
<i>FAM219B</i>	ENSG00000178761	1.15	0.32	3.65
<i>ZNF589</i>	ENSG00000164048	1.79	0.49	3.65
<i>GPR133</i>	ENSG00000111452	9.41	2.58	3.64
<i>ZNF182</i>	ENSG00000147118	1.32	0.36	3.64
<i>PRELP</i>	ENSG00000188783	8.59	2.36	3.64
<i>RP11-113K21.5</i>	ENSG00000246067	1.40	0.39	3.63
<i>PLEKHG4B</i>	ENSG00000153404	8.58	2.36	3.63
<i>CMAHP</i>	ENSG00000168405	4.34	1.20	3.63
<i>ANO2</i>	ENSG00000047617	5.55	1.53	3.63
<i>NEBL</i>	ENSG00000078114	6.66	1.83	3.63
<i>SAP25</i>	ENSG00000205307	4.23	1.17	3.63
<i>ZNF141</i>	ENSG00000131127	2.20	0.61	3.63
<i>RP11-145F16.2</i>	ENSG00000261050	3.06	0.84	3.63
<i>NCK2</i>	ENSG00000071051	2.26	0.62	3.62
<i>AK4</i>	ENSG00000162433	3.43	0.95	3.62
<i>EXTL3-AS1</i>	ENSG00000246339	4.24	1.17	3.62
<i>RP11-640M9.1</i>	ENSG00000236943	1.96	0.54	3.62
<i>NSUN5P2</i>	ENSG00000106133	2.51	0.69	3.62
<i>FMO1</i>	ENSG00000010932	10.48	2.90	3.62
<i>RP5-842K24.2</i>	ENSG00000232160	1.78	0.49	3.61
<i>RP11-115C21.2</i>	ENSG00000246089	1.91	0.53	3.61
<i>IPPK</i>	ENSG00000127080	1.11	0.31	3.61
<i>NIPSNAP3B</i>	ENSG00000165028	3.36	0.93	3.61
<i>BTN2A3P</i>	ENSG00000124549	1.60	0.44	3.61
<i>FRZB</i>	ENSG00000162998	8.87	2.46	3.61
<i>SFRP4</i>	ENSG00000106483	10.03	2.78	3.61
<i>CHRD</i>	ENSG00000090539	4.48	1.24	3.61
<i>HDAC9</i>	ENSG00000048052	3.11	0.86	3.60
<i>CYP4X1</i>	ENSG00000186377	9.17	2.54	3.60
<i>MTERFD3</i>	ENSG00000120832	2.23	0.62	3.60
<i>UXS1</i>	ENSG00000115652	1.24	0.34	3.60
<i>RP13-516M14.1</i>	ENSG00000260563	2.85	0.79	3.60
<i>KIAA0907</i>	ENSG00000132680	1.49	0.42	3.60
<i>PCBP1-AS1</i>	ENSG00000179818	1.88	0.52	3.60
<i>XPA</i>	ENSG00000136936	1.11	0.31	3.60
<i>ZNF75A</i>	ENSG00000162086	1.15	0.32	3.60
<i>TSPAN15</i>	ENSG00000099282	4.21	1.17	3.60
<i>ITGA10</i>	ENSG00000143127	3.06	0.85	3.58
<i>EMR2</i>	ENSG00000127507	4.47	1.25	3.58
<i>LINC00663</i>	ENSG00000266904	3.75	1.05	3.58
<i>SYPL2</i>	ENSG00000143028	3.91	1.09	3.58

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<i>STAG3L3</i>	ENSG00000174353	1.74	0.49	3.58
<i>TMCO6</i>	ENSG00000113119	1.29	0.36	3.57
<i>ADAM11</i>	ENSG00000073670	3.40	0.95	3.57
<i>TMEM106A</i>	ENSG00000184988	1.72	0.48	3.57
<i>DLEC1</i>	ENSG00000008226	6.99	1.96	3.57
<i>ACADS</i>	ENSG00000122971	2.47	0.69	3.56
<i>TENM3</i>	ENSG00000218336	7.80	2.19	3.56
<i>EXD3</i>	ENSG00000187609	2.43	0.68	3.56
<i>CX3CL1</i>	ENSG00000006210	8.96	2.52	3.56
<i>SYNPO</i>	ENSG00000171992	2.50	0.70	3.56
<i>CLK4</i>	ENSG00000113240	1.89	0.53	3.55
<i>TEX9</i>	ENSG00000151575	1.97	0.55	3.55
<i>TNFRSF14</i>	ENSG00000157873	3.51	0.99	3.55
<i>LRRC32</i>	ENSG00000137507	4.84	1.36	3.55
<i>RNASE1</i>	ENSG00000129538	9.92	2.80	3.55
<i>AC010441.1</i>	ENSG00000269636	3.49	0.98	3.55
<i>SMIM3</i>	ENSG00000256235	3.49	0.98	3.55
<i>H2AFY2</i>	ENSG00000099284	2.50	0.71	3.55
<i>SLC6A20</i>	ENSG00000163817	11.05	3.12	3.55
<i>MYH3</i>	ENSG00000109063	2.74	0.77	3.55
<i>CADPS2</i>	ENSG00000081803	8.44	2.38	3.55
<i>SPP1</i>	ENSG00000118785	9.96	2.81	3.54
<i>HSD17B11</i>	ENSG00000198189	2.14	0.60	3.54
<i>TTLL11</i>	ENSG00000175764	1.52	0.43	3.54
<i>PRKX</i>	ENSG00000183943	2.26	0.64	3.54
<i>SLC46A1</i>	ENSG00000076351	2.27	0.64	3.54
<i>COQ10A</i>	ENSG00000135469	1.02	0.29	3.54
<i>ENKD1</i>	ENSG00000124074	2.66	0.75	3.53
<i>MAMDC2</i>	ENSG00000165072	6.05	1.71	3.53
<i>PLXND1</i>	ENSG00000004399	2.05	0.58	3.53
<i>SFRP2</i>	ENSG00000145423	10.26	2.91	3.53
<i>PPM1M</i>	ENSG00000164088	1.58	0.45	3.53
<i>C16orf86</i>	ENSG00000159761	4.47	1.27	3.53
<i>CALML4</i>	ENSG00000129007	3.19	0.90	3.53
<i>EPHB2</i>	ENSG00000133216	2.76	0.78	3.53
<i>IL34</i>	ENSG00000157368	6.32	1.79	3.52
<i>RP11-541N10.3</i>	ENSG00000260461	2.42	0.69	3.52
<i>SRC</i>	ENSG00000197122	1.56	0.44	3.52
<i>RP11-287A8.6</i>	ENSG00000242010	3.50	1.00	3.52
<i>ASTN2</i>	ENSG00000148219	4.45	1.27	3.51
<i>ZNF737</i>	ENSG00000237440	1.84	0.52	3.51
<i>CLEC4A</i>	ENSG00000111729	4.46	1.27	3.51
<i>SLC25A38</i>	ENSG00000144659	1.04	0.30	3.51
<i>SAMHD1</i>	ENSG00000101347	1.98	0.56	3.51
<i>KDM4D</i>	ENSG00000186280	1.88	0.54	3.51

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<i>FAM83H</i>	ENSG00000180921	5.65	1.61	3.51
<i>HNMT</i>	ENSG00000150540	9.02	2.57	3.51
<i>FAM98C</i>	ENSG00000130244	1.16	0.33	3.50
<i>WDR31</i>	ENSG00000148225	1.69	0.48	3.50
<i>SESN1</i>	ENSG00000080546	3.75	1.07	3.50
<i>SCARA5</i>	ENSG00000168079	10.51	3.00	3.50
<i>DNASE1</i>	ENSG00000213918	1.60	0.46	3.50
<i>ZNF491</i>	ENSG00000177599	1.84	0.53	3.50
<i>CISH</i>	ENSG00000114737	3.54	1.01	3.49
<i>CGNL1</i>	ENSG00000128849	4.85	1.39	3.49
<i>C10orf32</i>	ENSG00000166275	1.80	0.51	3.49
<i>BDNF-AS</i>	ENSG00000245573	3.30	0.95	3.49
<i>C12orf76</i>	ENSG00000174456	1.90	0.55	3.49
<i>PRKCE</i>	ENSG00000171132	1.04	0.30	3.48
<i>CTSK</i>	ENSG00000143387	4.97	1.43	3.48
<i>DMGDH</i>	ENSG00000132837	3.94	1.13	3.47
<i>PARP16</i>	ENSG00000138617	1.44	0.41	3.47
<i>SEC31B</i>	ENSG00000075826	1.20	0.35	3.47
<i>FUCA1</i>	ENSG00000179163	1.62	0.47	3.47
<i>RP11-305E6.4</i>	ENSG00000259994	2.33	0.67	3.47
<i>WDR60</i>	ENSG00000126870	1.35	0.39	3.46
<i>TMEM129</i>	ENSG00000168936	1.31	0.38	3.46
<i>ZNF738</i>	ENSG00000172687	1.37	0.39	3.46
<i>MCF2L</i>	ENSG00000126217	5.21	1.51	3.46
<i>LSM5</i>	ENSG00000106355	1.02	0.29	3.46
<i>PAK1</i>	ENSG00000149269	1.52	0.44	3.46
<i>CTD-2037K23.2</i>	ENSG00000245556	1.61	0.47	3.46
<i>P2RX6</i>	ENSG00000099957	3.47	1.00	3.46
<i>ZCWPW2</i>	ENSG00000206559	1.29	0.37	3.46
<i>CORO7</i>	ENSG00000262246	2.28	0.66	3.45
<i>ZBED1</i>	ENSG00000214717	1.14	0.33	3.45
<i>PLEKHA6</i>	ENSG00000143850	10.14	2.94	3.45
<i>ATP8B4</i>	ENSG00000104043	7.03	2.04	3.45
<i>ZFP14</i>	ENSG00000142065	2.52	0.73	3.44
<i>LPIN3</i>	ENSG00000132793	1.83	0.53	3.44
<i>PRICKLE4</i>	ENSG00000124593	1.15	0.33	3.44
<i>ZNF763</i>	ENSG00000197054	1.79	0.52	3.44
<i>GMIP</i>	ENSG00000089639	2.09	0.61	3.43
<i>RP1-266L20.9</i>	ENSG00000266896	2.14	0.63	3.43
<i>PLCB2</i>	ENSG00000137841	6.60	1.93	3.43
<i>TRAF1</i>	ENSG00000056558	5.24	1.53	3.43
<i>RP11-572P18.1</i>	ENSG00000220842	2.19	0.64	3.42
<i>SLC22A17</i>	ENSG00000092096	4.89	1.43	3.42
<i>CORO7-PAM16</i>	ENSG00000103426	1.78	0.52	3.42
<i>JAK3</i>	ENSG00000105639	6.55	1.92	3.42

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<i>COA5</i>	ENSG00000183513	1.53	0.45	3.42
<i>CYP2E1</i>	ENSG00000130649	4.33	1.27	3.42
<i>KCNE4</i>	ENSG00000152049	4.80	1.40	3.42
<i>ARAP3</i>	ENSG00000120318	4.07	1.19	3.42
<i>WDR91</i>	ENSG00000105875	2.10	0.61	3.41
<i>TOMM7</i>	ENSG00000196683	1.54	0.45	3.41
<i>ACSL1</i>	ENSG00000151726	1.90	0.56	3.41
<i>C1orf204</i>	ENSG00000188004	2.74	0.80	3.41
<i>ZNF248</i>	ENSG00000198105	1.20	0.35	3.41
<i>THOC1</i>	ENSG00000079134	1.10	0.32	3.41
<i>ATP7B</i>	ENSG00000123191	3.11	0.91	3.41
<i>ZNF641</i>	ENSG00000167528	1.91	0.56	3.40
<i>MAP4K1</i>	ENSG00000104814	4.43	1.30	3.40
<i>AC135178.1</i>	ENSG00000198150	3.22	0.95	3.40
<i>NT5DC1</i>	ENSG00000178425	1.49	0.44	3.39
<i>SPAG8</i>	ENSG00000137098	3.67	1.08	3.39
<i>IFI44</i>	ENSG00000137965	2.69	0.79	3.39
<i>CYTH1</i>	ENSG00000108669	1.61	0.48	3.39
<i>AC004076.9</i>	ENSG00000268163	2.36	0.70	3.39
<i>KLKB1</i>	ENSG00000164344	4.20	1.24	3.38
<i>FAM110A</i>	ENSG00000125898	1.88	0.56	3.38
<i>PLD1</i>	ENSG00000075651	3.58	1.06	3.38
<i>GAL3ST4</i>	ENSG00000197093	6.06	1.79	3.38
<i>TCN2</i>	ENSG00000185339	3.36	0.99	3.38
<i>ICA1</i>	ENSG00000003147	5.79	1.72	3.37
<i>DNHD1</i>	ENSG00000179532	2.69	0.80	3.37
<i>GS1-358P8.4</i>	ENSG00000260822	2.41	0.72	3.37
<i>HCST</i>	ENSG00000126264	7.08	2.10	3.37
<i>LRP2BP</i>	ENSG00000109771	3.23	0.96	3.37
<i>NUPL2</i>	ENSG00000136243	1.23	0.37	3.37
<i>AP000346.2</i>	ENSG00000211683	2.56	0.76	3.37
<i>ATP6AP1L</i>	ENSG00000205464	2.55	0.76	3.36
<i>SFRP1</i>	ENSG00000104332	9.18	2.73	3.36
<i>PTPDC1</i>	ENSG00000158079	1.93	0.57	3.36
<i>SLC7A6OS</i>	ENSG00000103061	1.10	0.33	3.36
<i>GBP3</i>	ENSG00000117226	2.96	0.88	3.36
<i>KLHDC9</i>	ENSG00000162755	4.66	1.39	3.36
<i>SLPI</i>	ENSG00000124107	11.00	3.27	3.36
<i>ABCA7</i>	ENSG00000064687	2.26	0.67	3.36
<i>PLVAP</i>	ENSG00000130300	9.35	2.78	3.36
<i>TCTN2</i>	ENSG00000168778	1.17	0.35	3.36
<i>OGDHL</i>	ENSG00000197444	6.32	1.88	3.36
<i>RNF166</i>	ENSG00000158717	2.32	0.69	3.36
<i>HSPBAP1</i>	ENSG00000169087	1.55	0.46	3.35
<i>FAHD2CP</i>	ENSG00000231584	2.93	0.87	3.35

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>ARHGAP27</i>	ENSG00000159314	3.84	1.15	3.35
<i>AC018737.1</i>	ENSG00000236859	1.34	0.40	3.35
<i>SETD4</i>	ENSG00000185917	1.28	0.38	3.35
<i>RP11-35G9.5</i>	ENSG00000267787	2.45	0.73	3.35
<i>AP001258.4</i>	ENSG00000245571	1.56	0.47	3.35
<i>RP11-440L14.1</i>	ENSG00000249592	2.62	0.78	3.35
<i>ZFP36L2</i>	ENSG00000152518	2.49	0.74	3.35
<i>PHF11</i>	ENSG00000136147	1.58	0.47	3.35
<i>KAT2A</i>	ENSG00000108773	1.78	0.53	3.35
<i>CCL26</i>	ENSG00000006606	6.43	1.92	3.35
<i>RP11-799D4.4</i>	ENSG00000266947	2.87	0.86	3.35
<i>RNF207</i>	ENSG00000158286	3.32	0.99	3.34
<i>CXorf24</i>	ENSG00000196741	1.17	0.35	3.34
<i>ZNRD1</i>	ENSG00000066379	1.17	0.35	3.34
<i>RP11-600F24.7</i>	ENSG00000260285	2.13	0.64	3.33
<i>TRIB2</i>	ENSG00000071575	2.89	0.87	3.33
<i>ZNF219</i>	ENSG00000165804	2.35	0.70	3.33
<i>AOAH</i>	ENSG00000136250	8.16	2.45	3.33
<i>LPCAT3</i>	ENSG00000111684	1.80	0.54	3.33
<i>KRBOX4</i>	ENSG00000147121	1.17	0.35	3.33
<i>CCDC130</i>	ENSG00000104957	1.22	0.37	3.33
<i>N4BP2L1</i>	ENSG00000139597	3.50	1.05	3.32
<i>FAM104B</i>	ENSG00000182518	1.15	0.35	3.32
<i>TOR2A</i>	ENSG00000160404	1.37	0.41	3.32
<i>RP4-714D9.5</i>	ENSG00000261254	2.40	0.72	3.32
<i>TSPAN12</i>	ENSG00000106025	4.27	1.29	3.32
<i>C9orf9</i>	ENSG00000165698	1.50	0.45	3.32
<i>RP11-156E6.1</i>	ENSG00000259623	1.66	0.50	3.32
<i>CRABP2</i>	ENSG00000143320	6.24	1.88	3.31
<i>EVL</i>	ENSG00000196405	2.05	0.62	3.31
<i>UBA7</i>	ENSG00000182179	1.99	0.60	3.31
<i>RP11-262H14.1</i>	ENSG00000238113	2.49	0.75	3.31
<i>ENPP6</i>	ENSG00000164303	9.92	3.00	3.31
<i>CLIC2</i>	ENSG00000155962	6.63	2.00	3.31
<i>ZNF773</i>	ENSG00000152439	1.22	0.37	3.31
<i>ALX4</i>	ENSG00000052850	10.92	3.30	3.31
<i>CEBPD</i>	ENSG00000221869	5.00	1.51	3.31
<i>C3orf18</i>	ENSG00000088543	1.07	0.32	3.31
<i>NFKBID</i>	ENSG00000167604	2.49	0.75	3.30
<i>ABCC5</i>	ENSG00000114770	1.05	0.32	3.30
<i>LGALS3BP</i>	ENSG00000108679	1.15	0.35	3.30
<i>RP11-611E13.2</i>	ENSG00000257815	2.08	0.63	3.30
<i>EGFL6</i>	ENSG00000198759	10.38	3.15	3.30
<i>NINJ1</i>	ENSG00000131669	2.49	0.76	3.30
<i>DHX58</i>	ENSG00000108771	2.14	0.65	3.30

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>ADC</i>	ENSG00000142920	3.01	0.91	3.30
<i>SHMT1</i>	ENSG00000176974	1.52	0.46	3.29
<i>MRM1</i>	ENSG00000129282	1.80	0.55	3.29
<i>ETV5</i>	ENSG00000244405	1.91	0.58	3.29
<i>PCDHA11</i>	ENSG00000249158	5.50	1.67	3.29
<i>PPM1K</i>	ENSG00000163644	2.03	0.62	3.29
<i>ABHD3</i>	ENSG00000158201	1.97	0.60	3.28
<i>PCDHAC2</i>	ENSG00000243232	5.48	1.67	3.28
<i>PDCL3P4</i>	ENSG00000244119	3.30	1.00	3.28
<i>DLG2</i>	ENSG00000150672	4.44	1.35	3.28
<i>CROCCP2</i>	ENSG00000215908	2.02	0.61	3.28
<i>RINL</i>	ENSG00000187994	3.76	1.15	3.28
<i>C1orf63</i>	ENSG00000117616	2.10	0.64	3.28
<i>CDC14A</i>	ENSG00000079335	2.95	0.90	3.28
<i>PCDHA12</i>	ENSG00000251664	5.56	1.70	3.28
<i>CTD-2086O20.3</i>	ENSG00000267381	2.05	0.63	3.28
<i>TSNAXIP1</i>	ENSG00000102904	3.10	0.95	3.28
<i>RP11-27M15.1</i>	ENSG00000260942	3.12	0.95	3.28
<i>BRD8</i>	ENSG00000112983	1.00	0.31	3.27
<i>ZNF230</i>	ENSG00000159882	1.58	0.48	3.27
<i>ADCY4</i>	ENSG00000129467	6.18	1.89	3.27
<i>PIK3IP1</i>	ENSG00000100100	3.67	1.12	3.27
<i>RP11-35G9.3</i>	ENSG00000267040	2.36	0.72	3.27
<i>AC074117.10</i>	ENSG00000234072	1.93	0.59	3.27
<i>RP11-983P16.4</i>	ENSG00000257337	3.09	0.94	3.27
<i>GYPC</i>	ENSG00000136732	8.71	2.67	3.27
<i>SLC13A4</i>	ENSG00000164707	5.87	1.80	3.27
<i>USP21</i>	ENSG00000143258	1.17	0.36	3.27
<i>PPOX</i>	ENSG00000143224	1.45	0.44	3.27
<i>GALNT11</i>	ENSG00000178234	1.25	0.38	3.27
<i>CASP10</i>	ENSG00000003400	2.55	0.78	3.27
<i>CLK1</i>	ENSG00000013441	1.99	0.61	3.26
<i>TMEM218</i>	ENSG00000150433	1.10	0.34	3.26
<i>XXbac-BPG300A18.13</i>	ENSG00000259382	1.83	0.56	3.26
<i>ARFRP1</i>	ENSG00000101246	1.16	0.36	3.26
<i>LRRC8C</i>	ENSG00000171488	1.69	0.52	3.26
<i>RP4-758J18.2</i>	ENSG00000224870	1.20	0.37	3.26
<i>LAT2</i>	ENSG00000086730	5.60	1.72	3.26
<i>COMMD3</i>	ENSG00000148444	1.09	0.33	3.26
<i>CRYL1</i>	ENSG00000165475	2.30	0.71	3.26
<i>AGAP5</i>	ENSG00000172650	1.79	0.55	3.26
<i>LINC00263</i>	ENSG00000235823	1.85	0.57	3.25
<i>AD000090.2</i>	ENSG00000236144	2.14	0.66	3.25
<i>SPATA13</i>	ENSG00000182957	4.63	1.42	3.25
<i>ZNF211</i>	ENSG00000121417	1.38	0.43	3.25

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>NDUFS7</i>	ENSG00000115286	1.34	0.41	3.25
<i>STAC3</i>	ENSG00000185482	2.63	0.81	3.25
<i>ZNF429</i>	ENSG00000197013	1.65	0.51	3.25
<i>FBXO24</i>	ENSG00000106336	4.09	1.26	3.24
<i>VCAM1</i>	ENSG00000162692	8.14	2.51	3.24
<i>TMEM256</i>	ENSG00000205544	1.13	0.35	3.24
<i>HSPA6</i>	ENSG00000173110	6.42	1.98	3.24
<i>FMNL1</i>	ENSG00000184922	4.54	1.40	3.24
<i>DIP2A</i>	ENSG00000160305	1.50	0.46	3.24
<i>RP11-644F5.11</i>	ENSG00000258056	1.71	0.53	3.24
<i>EML3</i>	ENSG00000149499	1.42	0.44	3.24
<i>CTC-471J1.8</i>	ENSG00000267827	1.39	0.43	3.24
<i>ENPP4</i>	ENSG00000001561	1.66	0.51	3.23
<i>RPL32P3</i>	ENSG00000251474	1.85	0.57	3.23
<i>MSL3</i>	ENSG00000005302	1.05	0.32	3.23
<i>GPX3</i>	ENSG00000211445	7.82	2.42	3.23
<i>RP11-85F14.5</i>	ENSG00000239213	2.03	0.63	3.22
<i>JAKMIP3</i>	ENSG00000188385	4.56	1.42	3.22
<i>NAPA-AS1</i>	ENSG00000268061	2.23	0.69	3.22
<i>RP11-75L1.2</i>	ENSG00000213443	1.41	0.44	3.22
<i>CTD-2192J16.20</i>	ENSG00000269693	1.48	0.46	3.22
<i>DIRC3</i>	ENSG00000231672	4.32	1.34	3.22
<i>THAP10</i>	ENSG00000129028	1.07	0.33	3.22
<i>PCDHA13</i>	ENSG00000239389	5.45	1.69	3.22
<i>MRPL50</i>	ENSG00000136897	1.08	0.34	3.22
<i>C2orf68</i>	ENSG00000168887	1.22	0.38	3.22
<i>AC004166.7</i>	ENSG00000160828	1.61	0.50	3.22
<i>STAT5A</i>	ENSG00000126561	3.39	1.06	3.21
<i>ARHGAP9</i>	ENSG00000123329	4.94	1.54	3.21
<i>PCDHAC1</i>	ENSG00000248383	5.44	1.69	3.21
<i>DDRKG1</i>	ENSG00000198171	1.07	0.33	3.21
<i>PARP14</i>	ENSG00000173193	1.28	0.40	3.21
<i>ARHGEF1</i>	ENSG00000076928	1.04	0.32	3.21
<i>ARIH2OS</i>	ENSG00000221883	1.86	0.58	3.21
<i>MRPS25</i>	ENSG00000131368	1.17	0.36	3.21
<i>LMO4</i>	ENSG00000143013	3.64	1.13	3.21
<i>PCDHA8</i>	ENSG00000204962	5.42	1.69	3.20
<i>MED9</i>	ENSG00000141026	1.39	0.43	3.20
<i>TSGA10</i>	ENSG00000135951	3.20	1.00	3.20
<i>PCDHA10</i>	ENSG00000250120	5.26	1.64	3.20
<i>COL27A1</i>	ENSG00000196739	4.44	1.39	3.20
<i>PKDCC</i>	ENSG00000162878	4.29	1.34	3.20
<i>CDKN1C</i>	ENSG00000129757	5.26	1.64	3.20
<i>LYRM9</i>	ENSG00000232859	2.75	0.86	3.20
<i>PCDHA3</i>	ENSG00000255408	5.49	1.72	3.20

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>ZNF799</i>	ENSG00000196466	1.89	0.59	3.20
<i>COQ4</i>	ENSG00000167113	1.47	0.46	3.20
<i>PABPN1</i>	ENSG00000100836	1.33	0.42	3.20
<i>RP11-848P1.2</i>	ENSG00000264456	3.38	1.06	3.20
<i>IL17RC</i>	ENSG00000163702	1.16	0.36	3.19
<i>PCDHA9</i>	ENSG00000204961	5.42	1.70	3.19
<i>ZNF19</i>	ENSG00000157429	2.02	0.63	3.19
<i>ZNF775</i>	ENSG00000196456	1.51	0.47	3.19
<i>PCDHA7</i>	ENSG00000204963	5.39	1.69	3.19
<i>UBXN11</i>	ENSG00000158062	1.60	0.50	3.19
<i>SLCO2A1</i>	ENSG00000174640	5.97	1.87	3.19
<i>RGS14</i>	ENSG00000169220	1.93	0.61	3.19
<i>FIBIN</i>	ENSG00000176971	8.50	2.67	3.19
<i>SCARF1</i>	ENSG00000074660	4.66	1.46	3.18
<i>SUZ12P</i>	ENSG00000264538	1.55	0.49	3.18
<i>AC040173.1</i>	ENSG00000257026	1.94	0.61	3.18
<i>SMYD4</i>	ENSG00000186532	1.06	0.33	3.18
<i>AC092295.7</i>	ENSG00000233527	1.30	0.41	3.17
<i>CDK20</i>	ENSG00000156345	1.82	0.57	3.17
<i>CARD9</i>	ENSG00000187796	2.45	0.77	3.17
<i>FAM134C</i>	ENSG00000141699	1.17	0.37	3.17
<i>N4BP3</i>	ENSG00000145911	4.61	1.45	3.17
<i>FLT4</i>	ENSG00000037280	5.89	1.86	3.17
<i>PCDHA2</i>	ENSG00000204969	5.37	1.69	3.17
<i>RP11-488L18.10</i>	ENSG00000259865	1.63	0.52	3.17
<i>PDGFRL</i>	ENSG00000104213	3.75	1.19	3.17
<i>C11orf71</i>	ENSG00000180425	2.01	0.64	3.17
<i>PDK4</i>	ENSG00000004799	8.96	2.83	3.16
<i>ITPR1</i>	ENSG00000150995	2.91	0.92	3.16
<i>CTSL1</i>	ENSG00000135047	1.71	0.54	3.16
<i>DOK3</i>	ENSG00000146094	2.29	0.73	3.16
<i>AC093323.3</i>	ENSG00000170846	1.03	0.33	3.16
<i>JMJD7</i>	ENSG00000243789	1.08	0.34	3.16
<i>PCDHA4</i>	ENSG00000204967	5.38	1.70	3.16
<i>EPB41L2</i>	ENSG00000079819	2.03	0.64	3.16
<i>ARRB2</i>	ENSG00000141480	2.66	0.84	3.16
<i>PCDHA1</i>	ENSG00000204970	5.33	1.69	3.16
<i>FAM26F</i>	ENSG00000188820	4.96	1.57	3.16
<i>AL161915.1</i>	ENSG00000212670	2.42	0.77	3.16
<i>LRTOMT</i>	ENSG00000184154	1.12	0.36	3.16
<i>ZNF354B</i>	ENSG00000178338	1.01	0.32	3.15
<i>FCHO1</i>	ENSG00000130475	5.57	1.77	3.15
<i>RP11-473M20.14</i>	ENSG00000263072	1.45	0.46	3.15
<i>PUS10</i>	ENSG00000162927	1.12	0.36	3.15
<i>PRKCD</i>	ENSG00000163932	2.77	0.88	3.15

List of genes more highly expressed in primary merlin-negative meningiomas than in merlin-expressing cultured arachnoidal cells

<i>CAB39L</i>	ENSG00000102547	4.11	1.30	3.15
<i>SMAP2</i>	ENSG00000084070	2.44	0.77	3.15

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

Gene Symbol	ENSEMBL ID	mean fold change	sd	Z score
<i>ARMC9</i>	ENSG00000135931	-3.15	0.32	-9.72
<i>KRT17</i>	ENSG00000128422	-10.98	1.26	-8.71
<i>SAMD9</i>	ENSG00000205413	-2.54	0.35	-7.24
<i>GDA</i>	ENSG00000119125	-11.90	1.66	-7.15
<i>PGBD3</i>	ENSG00000258838	-4.21	0.59	-7.11
<i>PGBD3</i>	ENSG00000243251	-4.09	0.58	-7.08
<i>BACH1</i>	ENSG00000156273	-2.20	0.32	-6.89
<i>ERCC6</i>	ENSG00000225830	-3.69	0.54	-6.78
<i>PAPPA2</i>	ENSG00000116183	-7.32	1.18	-6.21
<i>LPP</i>	ENSG00000145012	-1.72	0.28	-6.12
<i>PKP1</i>	ENSG00000081277	-10.09	1.73	-5.84
<i>RNF168</i>	ENSG00000163961	-1.35	0.23	-5.80
<i>WEE1</i>	ENSG00000166483	-2.91	0.50	-5.79
<i>Metazoa_SRP</i>	ENSG00000243869	-3.61	0.63	-5.73
<i>SLC7A5</i>	ENSG00000103257	-5.96	1.05	-5.66
<i>SRPK1</i>	ENSG00000096063	-2.21	0.41	-5.42
<i>CCDC81</i>	ENSG00000149201	-3.48	0.65	-5.37
<i>PLXNA3</i>	ENSG00000130827	-1.55	0.30	-5.23
<i>C15orf62</i>	ENSG00000188277	-6.62	1.28	-5.19
<i>ACPL2</i>	ENSG00000155893	-2.21	0.44	-4.97
<i>CYB5R3</i>	ENSG00000100243	-1.60	0.32	-4.91
<i>RFX7</i>	ENSG00000181827	-1.37	0.28	-4.91
<i>ACTG2</i>	ENSG00000163017	-7.68	1.57	-4.89
<i>DLGAP4</i>	ENSG00000080845	-1.61	0.33	-4.89
<i>CEACAM19</i>	ENSG00000186567	-2.75	0.56	-4.87
<i>GALNT1</i>	ENSG00000141429	-2.70	0.56	-4.85
<i>CCDC80</i>	ENSG00000091986	-3.06	0.63	-4.83
<i>CTB-85P21.2</i>	ENSG00000259787	-4.51	0.94	-4.82
<i>ADCY9</i>	ENSG00000162104	-1.77	0.37	-4.81
<i>DUSP4</i>	ENSG00000120875	-5.50	1.14	-4.81
<i>SOGA1</i>	ENSG00000149639	-1.82	0.38	-4.77
<i>RDH10</i>	ENSG00000121039	-4.06	0.86	-4.73
<i>SMURF2</i>	ENSG00000108854	-1.73	0.37	-4.73
<i>LIF</i>	ENSG00000128342	-6.92	1.48	-4.68
<i>AL021707.2</i>	ENSG00000257034	-1.07	0.23	-4.67
<i>FBN1</i>	ENSG00000166147	-2.77	0.59	-4.66
<i>SHOC2</i>	ENSG00000108061	-1.41	0.30	-4.65
<i>NMD3</i>	ENSG00000169251	-1.00	0.22	-4.64
<i>RP11-280F2.2</i>	ENSG00000242759	-3.06	0.66	-4.63
<i>OXTR</i>	ENSG00000180914	-5.75	1.25	-4.62
<i>TMEM132D</i>	ENSG00000151952	-11.28	2.49	-4.53
<i>PVR</i>	ENSG00000073008	-4.16	0.92	-4.53

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

<i>HAS3</i>	ENSG00000103044	-2.34	0.52	-4.52
<i>OXSR1</i>	ENSG00000172939	-1.30	0.29	-4.49
<i>ABCC1</i>	ENSG00000103222	-4.39	0.98	-4.49
<i>KLHL5</i>	ENSG00000109790	-3.91	0.87	-4.48
<i>MYH9</i>	ENSG00000100345	-3.13	0.70	-4.48
<i>LAMC1</i>	ENSG00000135862	-2.75	0.61	-4.47
<i>XBP1</i>	ENSG00000100219	-1.71	0.38	-4.47
<i>RAP1GAP2</i>	ENSG00000132359	-2.51	0.56	-4.47
<i>RALGPS2</i>	ENSG00000116191	-5.53	1.24	-4.45
<i>CLIP1</i>	ENSG00000130779	-1.19	0.27	-4.45
<i>TLE4</i>	ENSG00000106829	-3.19	0.72	-4.44
<i>PGD</i>	ENSG00000142657	-1.99	0.45	-4.43
<i>PCK2</i>	ENSG00000100889	-2.43	0.55	-4.42
<i>FLNA</i>	ENSG00000196924	-2.80	0.64	-4.40
<i>PCDH7</i>	ENSG00000169851	-11.74	2.68	-4.39
<i>KCNK6</i>	ENSG00000099337	-2.81	0.65	-4.35
<i>ATXN1</i>	ENSG00000215019	-1.32	0.31	-4.32
<i>SLC12A6</i>	ENSG00000140199	-2.74	0.64	-4.32
<i>FADS3</i>	ENSG00000221968	-1.92	0.45	-4.31
<i>SSH1</i>	ENSG00000084112	-1.82	0.42	-4.31
<i>MED13</i>	ENSG00000108510	-1.14	0.26	-4.31
<i>ROBO2</i>	ENSG00000185008	-8.03	1.87	-4.30
<i>IL11</i>	ENSG00000095752	-5.78	1.35	-4.29
<i>GTPBP1</i>	ENSG00000100226	-1.02	0.24	-4.29
<i>PDIA5</i>	ENSG00000065485	-1.90	0.44	-4.29
<i>KRT7</i>	ENSG00000135480	-10.99	2.57	-4.28
<i>CREB5</i>	ENSG00000146592	-3.76	0.88	-4.26
<i>EP300</i>	ENSG00000100393	-1.06	0.25	-4.24
<i>CPEB2</i>	ENSG00000137449	-2.99	0.71	-4.23
<i>RP11-29G8.3</i>	ENSG00000261553	-3.19	0.76	-4.22
<i>LUZP2</i>	ENSG00000187398	-11.25	2.69	-4.19
<i>GPR156</i>	ENSG00000175697	-2.60	0.62	-4.18
<i>C5orf24</i>	ENSG00000181904	-1.87	0.45	-4.18
<i>SCAF11</i>	ENSG00000139218	-1.95	0.47	-4.17
<i>ZNF451</i>	ENSG00000112200	-1.39	0.33	-4.16
<i>VCL</i>	ENSG00000035403	-2.49	0.60	-4.15
<i>YARS</i>	ENSG00000134684	-2.87	0.69	-4.14
<i>SACS</i>	ENSG00000151835	-3.13	0.76	-4.12
<i>GLIPR1</i>	ENSG00000139278	-2.68	0.65	-4.12
<i>WARS</i>	ENSG00000140105	-2.33	0.57	-4.10
<i>RBFOX2</i>	ENSG00000100320	-1.49	0.36	-4.10
<i>PRKCA</i>	ENSG00000154229	-2.68	0.65	-4.09
<i>LCOR</i>	ENSG00000196233	-1.50	0.37	-4.09
<i>AC026806.2</i>	ENSG00000268913	-2.37	0.58	-4.08
<i>ALDH3A1</i>	ENSG00000108602	-6.84	1.68	-4.08

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

<i>AMIGO2</i>	ENSG00000139211	-5.49	1.35	-4.07
<i>RAMP1</i>	ENSG00000132329	-6.58	1.62	-4.07
<i>TMEM65</i>	ENSG00000164983	-1.55	0.38	-4.07
<i>FERMT2</i>	ENSG00000073712	-2.97	0.73	-4.07
<i>SLC6A9</i>	ENSG00000196517	-3.54	0.87	-4.06
<i>CACNG4</i>	ENSG00000075461	-5.75	1.42	-4.06
<i>THOC6</i>	ENSG00000131652	-1.66	0.41	-4.05
<i>MAPK1</i>	ENSG00000100030	-1.40	0.35	-4.04
<i>FAM69A</i>	ENSG00000154511	-2.53	0.63	-4.04
<i>UBE2H</i>	ENSG00000186591	-1.02	0.25	-4.04
<i>KDM5B</i>	ENSG00000117139	-1.56	0.39	-4.03
<i>SCN3A</i>	ENSG00000153253	-10.28	2.56	-4.02
<i>RC3H2</i>	ENSG00000056586	-1.12	0.28	-4.02
<i>ADAMTS1</i>	ENSG00000154734	-4.30	1.07	-4.00
<i>C11orf87</i>	ENSG00000185742	-8.82	2.21	-3.99
<i>AHR</i>	ENSG00000106546	-4.27	1.07	-3.99
<i>STK38L</i>	ENSG00000211455	-2.17	0.54	-3.99
<i>FANCE</i>	ENSG00000112039	-3.26	0.82	-3.99
<i>CLCF1</i>	ENSG00000175505	-5.65	1.42	-3.98
<i>CPNE7</i>	ENSG00000178773	-6.91	1.74	-3.97
<i>MAN2A1</i>	ENSG00000112893	-2.09	0.53	-3.96
<i>NPTN</i>	ENSG00000156642	-1.38	0.35	-3.96
<i>FBXO30</i>	ENSG00000118496	-1.66	0.42	-3.95
<i>RP11-16M8.2</i>	ENSG00000246430	-5.51	1.40	-3.94
<i>AC144831.1</i>	ENSG00000261888	-4.02	1.02	-3.93
<i>GSK3B</i>	ENSG00000082701	-1.20	0.31	-3.93
<i>SYNC</i>	ENSG00000162520	-3.55	0.90	-3.93
<i>ZNF347</i>	ENSG00000197937	-1.96	0.50	-3.92
<i>UBASH3B</i>	ENSG00000154127	-4.74	1.21	-3.92
<i>IGFBP1</i>	ENSG00000146678	-10.96	2.80	-3.92
<i>MTHFD1L</i>	ENSG00000120254	-2.29	0.59	-3.89
<i>MYOCD</i>	ENSG00000141052	-9.34	2.40	-3.89
<i>UGDH</i>	ENSG00000109814	-3.80	0.98	-3.89
<i>ANK1</i>	ENSG00000029534	-6.38	1.64	-3.88
<i>MAFG-AS1</i>	ENSG00000265688	-2.24	0.58	-3.88
<i>FAT1</i>	ENSG00000083857	-2.75	0.71	-3.87
<i>TGFB1I1</i>	ENSG00000140682	-2.03	0.53	-3.87
<i>PPP3CA</i>	ENSG00000138814	-1.48	0.38	-3.87
<i>CCDC50</i>	ENSG00000152492	-1.24	0.32	-3.86
<i>ALDH1A3</i>	ENSG00000184254	-9.14	2.37	-3.86
<i>KCTD16</i>	ENSG00000183775	-5.60	1.46	-3.85
<i>NF2</i>	ENSG00000186575	-3.24	0.84	-3.84
<i>STAM</i>	ENSG00000136738	-1.53	0.40	-3.84
<i>LOXL3</i>	ENSG00000115318	-3.45	0.90	-3.84
<i>TXNRD1</i>	ENSG00000198431	-2.74	0.72	-3.83

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

<i>SPIRE1</i>	ENSG00000134278	-1.74	0.46	-3.81
<i>NAP1L4P1</i>	ENSG00000177173	-1.98	0.52	-3.81
<i>QSOX1</i>	ENSG00000116260	-2.55	0.67	-3.81
<i>CD109</i>	ENSG00000156535	-5.43	1.43	-3.81
<i>MTHFD2</i>	ENSG00000065911	-2.71	0.71	-3.80
<i>DGKA</i>	ENSG00000065357	-1.04	0.27	-3.80
<i>GNAI1</i>	ENSG00000127955	-2.50	0.66	-3.79
<i>DOK1</i>	ENSG00000115325	-1.23	0.33	-3.78
<i>ASNS</i>	ENSG00000070669	-2.17	0.58	-3.77
<i>BAG2</i>	ENSG00000112208	-3.30	0.87	-3.77
<i>LNPEP</i>	ENSG00000113441	-3.24	0.86	-3.77
<i>SERAC1</i>	ENSG00000122335	-1.80	0.48	-3.77
<i>RP11-448G15.3</i>	ENSG00000261490	-2.53	0.67	-3.76
<i>SLC4A2</i>	ENSG00000164889	-1.48	0.40	-3.74
<i>MYADM</i>	ENSG00000179820	-3.35	0.90	-3.72
<i>CYP26B1</i>	ENSG00000003137	-5.46	1.47	-3.72
<i>VPS13A</i>	ENSG00000197969	-2.97	0.80	-3.71
<i>LOXL1-AS1</i>	ENSG00000261801	-2.69	0.72	-3.71
<i>MAP3K9</i>	ENSG00000006432	-3.15	0.85	-3.71
<i>SRD5A1</i>	ENSG00000145545	-2.40	0.65	-3.70
<i>MLF1</i>	ENSG00000178053	-1.86	0.50	-3.70
<i>SEC24D</i>	ENSG00000150961	-1.73	0.47	-3.69
<i>HCN2</i>	ENSG00000099822	-4.59	1.24	-3.69
<i>DGKH</i>	ENSG00000102780	-4.83	1.31	-3.69
<i>ERBB3</i>	ENSG00000065361	-5.61	1.52	-3.68
<i>ZC3H7B</i>	ENSG00000100403	-1.42	0.38	-3.68
<i>AC010761.8</i>	ENSG00000264577	-9.13	2.48	-3.68
<i>IARS</i>	ENSG00000196305	-1.62	0.44	-3.68
<i>FSTL1</i>	ENSG00000163430	-1.54	0.42	-3.68
<i>MMP1</i>	ENSG00000196611	-10.19	2.77	-3.68
<i>COL4A5</i>	ENSG00000188153	-3.07	0.84	-3.66
<i>PTPRK</i>	ENSG00000152894	-3.82	1.05	-3.66
<i>AKIRIN1</i>	ENSG00000174574	-1.23	0.34	-3.65
<i>SCARA3</i>	ENSG00000168077	-2.48	0.68	-3.65
<i>ADAMTS14</i>	ENSG00000138316	-5.34	1.47	-3.64
<i>REV3L</i>	ENSG00000009413	-1.84	0.51	-3.63
<i>LHX4</i>	ENSG00000121454	-7.93	2.18	-3.63
<i>CTTNBP2NL</i>	ENSG00000143079	-2.10	0.58	-3.62
<i>WNT2B</i>	ENSG00000134245	-3.43	0.95	-3.62
<i>DST</i>	ENSG00000151914	-2.02	0.56	-3.62
<i>COL1A1</i>	ENSG00000108821	-2.54	0.70	-3.62
<i>PVRL3</i>	ENSG00000177707	-2.36	0.65	-3.61
<i>AC013470.6</i>	ENSG00000236048	-1.80	0.50	-3.61
<i>SYNJ2</i>	ENSG00000078269	-2.63	0.73	-3.61
<i>TBC1D19</i>	ENSG00000109680	-1.75	0.48	-3.61

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<i>BICD1</i>	ENSG00000151746	-2.38	0.66	-3.60
<i>PPT2</i>	ENSG00000221988	-1.28	0.36	-3.59
<i>MAP4</i>	ENSG00000047849	-1.36	0.38	-3.59
<i>AC005544.1</i>	ENSG00000214167	-5.65	1.58	-3.59
<i>NDFIP2</i>	ENSG00000102471	-1.53	0.43	-3.59
<i>HSPG2</i>	ENSG00000142798	-1.99	0.56	-3.57
<i>SLC36A1</i>	ENSG00000123643	-2.57	0.72	-3.56
<i>PPP1R12A</i>	ENSG00000058272	-1.01	0.28	-3.56
<i>MICALL1</i>	ENSG00000100139	-2.90	0.82	-3.56
<i>C1orf198</i>	ENSG00000119280	-3.36	0.94	-3.56
<i>GLIS3</i>	ENSG00000107249	-5.96	1.68	-3.56
<i>TP53BP2</i>	ENSG00000143514	-1.06	0.30	-3.56
<i>TCF20</i>	ENSG00000100207	-1.19	0.34	-3.55
<i>ACTN1</i>	ENSG00000072110	-2.41	0.68	-3.54
<i>JOSD1</i>	ENSG00000100221	-1.25	0.35	-3.54
<i>N4BP2</i>	ENSG00000078177	-2.23	0.63	-3.54
<i>AMPH</i>	ENSG00000078053	-3.13	0.89	-3.53
<i>DUSP8</i>	ENSG00000184545	-4.28	1.21	-3.53
<i>ARHGAP29</i>	ENSG00000137962	-2.62	0.74	-3.52
<i>FAM114A1</i>	ENSG00000197712	-1.54	0.44	-3.52
<i>NCOA7</i>	ENSG00000111912	-2.89	0.82	-3.52
<i>TRAM2</i>	ENSG00000065308	-3.02	0.86	-3.51
<i>UBE2HP1</i>	ENSG00000253677	-2.32	0.66	-3.50
<i>AMER1</i>	ENSG00000184675	-1.19	0.34	-3.50
<i>MAFG</i>	ENSG00000197063	-1.50	0.43	-3.50
<i>SLC16A7</i>	ENSG00000118596	-7.62	2.18	-3.49
<i>ACTN4</i>	ENSG00000130402	-2.32	0.67	-3.48
<i>ZFHX4</i>	ENSG00000091656	-4.87	1.40	-3.48
<i>RNF217</i>	ENSG00000146373	-1.72	0.49	-3.48
<i>TUBA1A</i>	ENSG00000167552	-2.26	0.65	-3.47
<i>ABL2</i>	ENSG00000143322	-2.22	0.64	-3.47
<i>SYNJ1</i>	ENSG00000159082	-1.50	0.43	-3.47
<i>PLEKHG4</i>	ENSG00000196155	-2.35	0.68	-3.46
<i>PRR14L</i>	ENSG00000183530	-1.35	0.39	-3.46
<i>RP1-152L7.5</i>	ENSG00000216775	-3.63	1.05	-3.46
<i>ZBED4</i>	ENSG00000100426	-1.50	0.43	-3.46
<i>MAN1A2</i>	ENSG00000198162	-1.73	0.50	-3.46
<i>COMT</i>	ENSG00000093010	-1.34	0.39	-3.45
<i>KIF5B</i>	ENSG00000170759	-1.65	0.48	-3.45
<i>LASP1</i>	ENSG00000002834	-1.63	0.47	-3.45
<i>RBM15</i>	ENSG00000162775	-1.55	0.45	-3.44
<i>SLC17A5</i>	ENSG00000119899	-1.59	0.46	-3.43
<i>PLS3</i>	ENSG00000102024	-2.90	0.84	-3.43
<i>PTGS2</i>	ENSG00000073756	-6.34	1.85	-3.43
<i>GFPT1</i>	ENSG00000198380	-1.37	0.40	-3.42

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<i>DBN1</i>	ENSG00000113758	-1.38	0.40	-3.42
<i>SLC5A3</i>	ENSG00000198743	-3.39	0.99	-3.42
<i>XPO6</i>	ENSG00000169180	-1.05	0.31	-3.41
<i>WDR1</i>	ENSG00000071127	-2.06	0.60	-3.41
<i>NDEL1</i>	ENSG00000166579	-1.05	0.31	-3.40
<i>AC098614.2</i>	ENSG00000213846	-2.36	0.69	-3.40
<i>ADRB2</i>	ENSG00000169252	-3.62	1.07	-3.40
<i>CDC42EP1</i>	ENSG00000128283	-2.71	0.80	-3.39
<i>TMEM184B</i>	ENSG00000198792	-1.50	0.44	-3.39
<i>NEK7</i>	ENSG00000151414	-2.28	0.67	-3.39
<i>KIAA1586</i>	ENSG00000168116	-1.32	0.39	-3.39
<i>DDA1</i>	ENSG00000130311	-1.10	0.33	-3.38
<i>PCDH10</i>	ENSG00000138650	-9.84	2.91	-3.38
<i>NTN4</i>	ENSG00000074527	-4.11	1.22	-3.38
<i>SLC1A5</i>	ENSG00000105281	-3.40	1.01	-3.38
<i>AHNAK2</i>	ENSG00000185567	-5.03	1.49	-3.37
<i>CSRP2</i>	ENSG00000175183	-2.25	0.67	-3.37
<i>ARSJ</i>	ENSG00000180801	-5.69	1.69	-3.37
<i>RP4-671G15.3</i>	ENSG00000248201	-1.91	0.57	-3.37
<i>STAC</i>	ENSG00000144681	-9.15	2.72	-3.37
<i>LMO7</i>	ENSG00000136153	-3.26	0.97	-3.37
<i>RP11-360F5.3</i>	ENSG00000249685	-3.29	0.98	-3.37
<i>RGS4</i>	ENSG00000117152	-8.02	2.39	-3.36
<i>SLC4A7</i>	ENSG00000033867	-2.72	0.81	-3.36
<i>MTMR2</i>	ENSG00000087053	-1.16	0.35	-3.35
<i>SYT1</i>	ENSG00000067715	-7.77	2.32	-3.35
<i>CAPN5</i>	ENSG00000149260	-2.75	0.82	-3.35
<i>KLF6</i>	ENSG00000067082	-2.48	0.74	-3.35
<i>BDNF</i>	ENSG00000176697	-9.97	2.98	-3.35
<i>NEK10</i>	ENSG00000163491	-3.77	1.13	-3.34
<i>LOC124685</i>	ENSG00000228118	-2.24	0.67	-3.34
<i>THOC5</i>	ENSG00000100296	-1.51	0.45	-3.34
<i>PDLIM5</i>	ENSG00000163110	-2.36	0.71	-3.34
<i>TSHZ3</i>	ENSG00000121297	-1.70	0.51	-3.34
<i>COL4A1</i>	ENSG00000187498	-4.03	1.21	-3.34
<i>IPO5</i>	ENSG00000065150	-1.63	0.49	-3.34
<i>EPRS</i>	ENSG00000136628	-1.64	0.49	-3.33
<i>GS1-44D20.1</i>	ENSG00000254332	-2.66	0.80	-3.33
<i>COL5A2</i>	ENSG00000204262	-2.81	0.84	-3.32
<i>FAM132B</i>	ENSG00000178752	-6.88	2.07	-3.32
<i>CTIF</i>	ENSG00000134030	-1.56	0.47	-3.32
<i>TUFT1</i>	ENSG00000143367	-3.19	0.96	-3.32
<i>C22orf29</i>	ENSG00000215012	-1.84	0.56	-3.31
<i>PITPNB</i>	ENSG00000180957	-1.73	0.52	-3.31
<i>RICTOR</i>	ENSG00000164327	-1.24	0.38	-3.29

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<i>MICAL3</i>	ENSG00000243156	-1.77	0.54	-3.29
<i>RIMS1</i>	ENSG00000079841	-7.90	2.41	-3.29
<i>RP11-333E13.2</i>	ENSG00000250568	-1.70	0.52	-3.28
<i>TEAD1</i>	ENSG00000187079	-1.36	0.42	-3.28
<i>TFAP2A</i>	ENSG00000137203	-5.43	1.65	-3.28
<i>PPRC1</i>	ENSG00000148840	-1.36	0.41	-3.28
<i>ASB1</i>	ENSG00000065802	-1.57	0.48	-3.28
<i>ACTG1</i>	ENSG00000184009	-1.52	0.46	-3.28
<i>COL4A2</i>	ENSG00000134871	-3.77	1.15	-3.28
<i>LIMS1</i>	ENSG00000169756	-1.64	0.50	-3.27
<i>RP11-145M9.3</i>	ENSG00000181260	-3.15	0.97	-3.27
<i>PGM2L1</i>	ENSG00000165434	-2.47	0.76	-3.26
<i>AL021977.1</i>	ENSG00000256873	-1.58	0.49	-3.26
<i>DUSP5</i>	ENSG00000138166	-5.06	1.56	-3.26
<i>SGIP1</i>	ENSG00000118473	-4.03	1.24	-3.25
<i>TRIB1</i>	ENSG00000173334	-4.13	1.28	-3.24
<i>CYP51A1</i>	ENSG00000001630	-1.41	0.43	-3.24
<i>VPS13B</i>	ENSG00000132549	-1.31	0.41	-3.23
<i>IGF2BP3</i>	ENSG00000136231	-6.94	2.15	-3.23
<i>MYL12A</i>	ENSG00000101608	-1.63	0.51	-3.22
<i>LRRD1</i>	ENSG00000240720	-1.39	0.43	-3.22
<i>INHBA</i>	ENSG00000122641	-5.24	1.63	-3.21
<i>CSRP1</i>	ENSG00000159176	-1.51	0.47	-3.21
<i>PGRMC2</i>	ENSG00000164040	-1.19	0.37	-3.20
<i>MSNP1</i>	ENSG00000251593	-1.55	0.48	-3.20
<i>USP13</i>	ENSG00000058056	-2.21	0.69	-3.20
<i>TPM1</i>	ENSG00000140416	-2.17	0.68	-3.20
<i>DHRS9</i>	ENSG00000073737	-5.47	1.71	-3.20
<i>EDIL3</i>	ENSG00000164176	-7.27	2.28	-3.19
<i>TERT</i>	ENSG00000164362	-10.58	3.32	-3.18
<i>GPRC5A</i>	ENSG00000013588	-6.20	1.95	-3.18
<i>ODC1</i>	ENSG00000115758	-1.78	0.56	-3.18
<i>EPHA5</i>	ENSG00000145242	-11.75	3.70	-3.18
<i>ZNF469</i>	ENSG00000225614	-2.66	0.84	-3.17
<i>ENTPD7</i>	ENSG00000198018	-2.27	0.72	-3.17
<i>FMR1</i>	ENSG00000102081	-1.07	0.34	-3.17
<i>PDLIM3</i>	ENSG00000154553	-4.23	1.33	-3.17
<i>DPY19L1</i>	ENSG00000173852	-1.26	0.40	-3.17
<i>TCF7</i>	ENSG00000081059	-3.26	1.03	-3.17
<i>CTD-3252C9.4</i>	ENSG00000267519	-3.25	1.03	-3.16
<i>PALLD</i>	ENSG00000129116	-3.51	1.11	-3.16
<i>KCNH1</i>	ENSG00000143473	-6.21	1.96	-3.16
<i>OSR2</i>	ENSG00000164920	-8.36	2.65	-3.16
<i>AVEN</i>	ENSG00000169857	-1.54	0.49	-3.16
<i>ADAMTS8</i>	ENSG00000134917	-7.68	2.43	-3.16

List of genes more highly expressed in merlin-expressing cultured arachnoidal cells than in primary merlin-negative meningiomas

<i>TUBA4A</i>	ENSG00000127824	-3.25	1.03	-3.16
<i>RBMS2</i>	ENSG00000076067	-1.21	0.38	-3.16
<i>DSEL</i>	ENSG00000171451	-1.77	0.56	-3.15
<i>CSGALNACT2</i>	ENSG00000169826	-1.16	0.37	-3.15

List of genes robustly upregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

Gene Symbol	Ensembl ID	logFC	logCPM	F	PValue	Benjamini-Hochberg P value	Bonferroni P value
<i>TPTEP1</i>	ENSG00000100181	14.65	4.44	1039.25	2.40E-22	3.70E-18	3.70E-18
<i>PNPLA4</i>	ENSG00000006757	12.56	3.50	858.24	2.65E-21	1.36E-17	4.08E-17
<i>CACNA1A</i>	ENSG00000141837	5.43	2.98	462.61	7.58E-19	1.67E-15	1.17E-14
<i>KHDRBS3</i>	ENSG00000131773	3.83	1.46	436.60	1.62E-18	3.12E-15	2.50E-14
<i>RNF182</i>	ENSG00000180537	5.25	4.52	354.65	2.41E-17	3.72E-14	3.72E-13
<i>C1orf21</i>	ENSG00000116667	6.27	2.80	328.13	6.55E-17	9.19E-14	1.01E-12
<i>ZNF516</i>	ENSG00000101493	7.55	3.07	321.06	8.67E-17	1.11E-13	1.34E-12
<i>CDCA7L</i>	ENSG00000164649	2.04	5.92	288.38	3.41E-16	4.04E-13	5.25E-12
<i>LPCAT2</i>	ENSG00000087253	8.39	3.12	250.36	2.03E-15	1.78E-12	3.13E-11
<i>CDH13</i>	ENSG00000140945	3.18	5.76	232.85	5.02E-15	3.87E-12	7.74E-11
<i>ENOX1</i>	ENSG00000120658	4.21	1.98	215.03	1.35E-14	8.67E-12	2.08E-10
<i>SGK223</i>	ENSG00000182319	4.16	5.41	212.69	1.54E-14	9.37E-12	2.38E-10
<i>MFAP3L</i>	ENSG00000198948	4.43	4.41	212.27	1.58E-14	9.37E-12	2.44E-10
<i>TMEM178B</i>	ENSG00000261115	3.06	5.62	205.69	2.33E-14	1.19E-11	3.59E-10
<i>OSBPL3</i>	ENSG00000070882	1.78	5.32	186.26	7.82E-14	3.35E-11	1.21E-09
<i>PSG1</i>	ENSG00000231924	8.24	3.49	175.92	1.56E-13	6.17E-11	2.41E-09
<i>EBF2</i>	ENSG00000221818	2.99	3.88	171.78	2.08E-13	7.81E-11	3.20E-09
<i>PRUNE2</i>	ENSG00000106772	3.94	4.43	159.42	5.07E-13	1.79E-10	7.82E-09
<i>EPHA4</i>	ENSG00000116106	3.00	3.68	159.31	5.11E-13	1.79E-10	7.88E-09
<i>CNNM1</i>	ENSG00000119946	7.69	-0.02	155.43	6.85E-13	2.20E-10	1.06E-08
<i>TRIM58</i>	ENSG00000162722	4.04	4.95	144.70	1.59E-12	4.32E-10	2.45E-08
<i>KIAA1244</i>	ENSG00000112379	2.61	4.43	144.25	1.65E-12	4.32E-10	2.55E-08
<i>ANKRD18B</i>	ENSG00000230453	8.15	-0.56	154.57	2.18E-12	5.43E-10	3.36E-08
<i>FRMD4B</i>	ENSG00000114541	6.48	2.80	133.68	4.01E-12	9.36E-10	6.17E-08
<i>PODXL2</i>	ENSG00000114631	4.72	3.28	131.80	4.72E-12	1.07E-09	7.27E-08
<i>TRPV2</i>	ENSG00000187688	5.37	1.93	131.49	4.85E-12	1.08E-09	7.48E-08
<i>LZTS1</i>	ENSG00000061337	2.22	4.60	123.11	1.03E-11	2.15E-09	1.59E-07
<i>PTPRF</i>	ENSG00000142949	2.46	6.67	120.03	1.38E-11	2.72E-09	2.12E-07
<i>MIR137HG</i>	ENSG00000225206	4.35	2.07	120.02	1.38E-11	2.72E-09	2.12E-07
<i>DNALI1</i>	ENSG00000163879	4.65	0.14	118.46	1.60E-11	3.12E-09	2.47E-07
<i>MMP2</i>	ENSG00000087245	5.22	4.83	118.15	1.65E-11	3.13E-09	2.54E-07
<i>STXBP6</i>	ENSG00000168952	2.34	3.85	114.77	2.29E-11	4.19E-09	3.52E-07
<i>FLJ14082</i>	ENSG00000229689	2.76	0.93	113.86	2.50E-11	4.53E-09	3.85E-07
<i>ANKFN1</i>	ENSG00000153930	5.76	-0.73	121.96	2.90E-11	5.17E-09	4.47E-07
<i>THRB</i>	ENSG00000151090	4.34	2.63	112.30	2.92E-11	5.17E-09	4.50E-07
<i>OR2W3</i>	ENSG00000238243	3.98	2.33	109.68	3.80E-11	6.66E-09	5.86E-07
<i>PTN</i>	ENSG00000105894	3.54	2.39	108.07	4.48E-11	7.60E-09	6.91E-07
<i>LAMA1</i>	ENSG00000101680	3.70	5.36	107.49	4.76E-11	7.98E-09	7.34E-07
<i>PCLO</i>	ENSG00000186472	2.80	4.92	104.78	6.32E-11	1.00E-08	9.75E-07
<i>FRMD3</i>	ENSG00000172159	4.83	2.57	104.01	6.86E-11	1.07E-08	1.06E-06
<i>AC108142.1</i>	ENSG00000177822	5.07	1.35	102.66	7.92E-11	1.20E-08	1.22E-06
<i>ZNF681</i>	ENSG00000196172	2.99	1.07	97.57	1.38E-10	1.94E-08	2.13E-06
<i>PSG4</i>	ENSG00000243137	4.33	3.39	90.93	2.97E-10	3.78E-08	4.57E-06
<i>SCRN1</i>	ENSG00000136193	2.13	6.52	90.22	3.22E-10	4.01E-08	4.97E-06
<i>RP11-366M4.11</i>	ENSG00000248632	1.89	2.01	88.75	3.85E-10	4.68E-08	5.93E-06
<i>ST3GAL6</i>	ENSG00000064225	3.56	0.58	88.74	3.85E-10	4.68E-08	5.94E-06
<i>LOXL2</i>	ENSG00000134013	1.24	8.82	106.21	3.96E-10	4.77E-08	6.10E-06

List of genes robustly upregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

<i>NRG1</i>	ENSG00000157168	4.47	4.19	88.17	4.13E-10	4.93E-08	6.36E-06
<i>GPR126</i>	ENSG00000112414	3.47	2.37	87.28	4.60E-10	5.37E-08	7.09E-06
<i>FAM160A1</i>	ENSG00000164142	2.66	3.20	86.63	4.98E-10	5.72E-08	7.67E-06
<i>AP1M2</i>	ENSG00000129354	3.42	2.06	86.44	5.09E-10	5.82E-08	7.85E-06
<i>GALM</i>	ENSG00000143891	5.10	3.15	84.14	6.78E-10	7.46E-08	1.04E-05
<i>CTSC</i>	ENSG00000109861	1.92	8.14	82.90	7.93E-10	8.54E-08	1.22E-05
<i>GDF6</i>	ENSG00000156466	3.21	5.75	82.71	8.12E-10	8.69E-08	1.25E-05
<i>PSD3</i>	ENSG00000156011	1.42	6.41	80.94	1.02E-09	1.08E-07	1.57E-05
<i>PDE1C</i>	ENSG00000154678	4.98	7.18	79.40	1.24E-09	1.28E-07	1.92E-05
<i>B4GALT6</i>	ENSG00000118276	2.19	3.56	77.74	1.55E-09	1.52E-07	2.39E-05
<i>PAGE5</i>	ENSG00000158639	3.95	0.89	77.21	1.66E-09	1.59E-07	2.56E-05
<i>MYO5B</i>	ENSG00000167306	2.38	3.00	76.98	1.71E-09	1.61E-07	2.64E-05
<i>CTB-175P5.4</i>	ENSG00000269416	5.95	0.60	76.66	1.79E-09	1.65E-07	2.76E-05
<i>GPR85</i>	ENSG00000164604	2.36	1.03	76.45	1.84E-09	1.69E-07	2.84E-05
<i>GBX2</i>	ENSG00000168505	3.62	2.54	74.03	2.56E-09	2.26E-07	3.95E-05
<i>PLK2</i>	ENSG00000145632	1.28	8.76	70.07	4.47E-09	3.75E-07	6.89E-05
<i>MCTP1</i>	ENSG00000175471	3.60	2.26	69.15	5.11E-09	4.19E-07	7.88E-05
<i>ZNF662</i>	ENSG00000182983	4.38	0.24	69.07	5.17E-09	4.20E-07	7.97E-05
<i>HRK</i>	ENSG00000135116	3.65	0.98	68.96	5.25E-09	4.24E-07	8.09E-05
<i>CCBE1</i>	ENSG00000183287	2.29	6.30	68.17	5.89E-09	4.68E-07	9.09E-05
<i>RP11-86A5.1</i>	ENSG00000233403	9.23	-1.31	92.96	6.54E-09	5.12E-07	1.01E-04
<i>MPP1</i>	ENSG00000130830	3.92	4.47	67.31	6.69E-09	5.18E-07	1.03E-04
<i>RP11-25K19.1</i>	ENSG00000167912	2.98	0.70	67.23	6.76E-09	5.21E-07	1.04E-04
<i>AOX1</i>	ENSG00000138356	1.68	5.69	67.07	6.93E-09	5.31E-07	1.07E-04
<i>KIRREL3</i>	ENSG00000149571	1.18	5.17	71.08	7.76E-09	5.93E-07	1.20E-04
<i>CACHD1</i>	ENSG00000158966	2.86	2.13	65.00	9.45E-09	7.04E-07	1.46E-04
<i>CADM1</i>	ENSG00000182985	2.01	3.44	64.61	1.00E-08	7.37E-07	1.55E-04
<i>C8orf47</i>	ENSG00000177459	4.46	0.29	62.98	1.29E-08	9.20E-07	1.99E-04
<i>HBEGF</i>	ENSG00000113070	3.01	5.99	62.93	1.30E-08	9.24E-07	2.00E-04
<i>PAG1</i>	ENSG00000076641	2.42	4.26	62.80	1.33E-08	9.35E-07	2.04E-04
<i>RAB11FIP1</i>	ENSG00000156675	1.72	7.82	62.79	1.33E-08	9.35E-07	2.05E-04
<i>CCNJL</i>	ENSG00000135083	2.49	2.41	60.78	1.82E-08	1.23E-06	2.81E-04
<i>MGAM</i>	ENSG00000257335	3.93	1.35	59.91	2.09E-08	1.38E-06	3.23E-04
<i>CXADRP3</i>	ENSG00000265766	2.74	1.51	63.21	2.13E-08	1.40E-06	3.28E-04
<i>LONRF3</i>	ENSG00000175556	8.49	0.31	67.10	2.24E-08	1.45E-06	3.45E-04
<i>SNAPC1</i>	ENSG00000023608	1.43	7.70	58.30	2.72E-08	1.71E-06	4.19E-04
<i>CGB7</i>	ENSG00000196337	2.14	0.62	58.30	2.72E-08	1.71E-06	4.19E-04
<i>OPN3</i>	ENSG00000054277	1.24	4.14	63.47	2.79E-08	1.75E-06	4.31E-04
<i>TRIM61</i>	ENSG00000183439	1.64	1.77	88.85	2.85E-08	1.77E-06	4.40E-04
<i>FAM212B</i>	ENSG00000197852	1.96	4.06	57.57	3.07E-08	1.89E-06	4.73E-04
<i>AP1S3</i>	ENSG00000152056	1.23	4.50	57.19	3.26E-08	1.99E-06	5.03E-04
<i>DYSF</i>	ENSG00000135636	2.49	5.87	55.81	4.11E-08	2.47E-06	6.34E-04
<i>PSG2</i>	ENSG00000242221	6.64	-0.26	55.65	4.22E-08	2.52E-06	6.51E-04
<i>SEMA7A</i>	ENSG00000138623	2.41	6.65	54.60	5.05E-08	2.95E-06	7.79E-04
<i>IL7R</i>	ENSG00000168685	5.83	1.87	54.22	5.39E-08	3.14E-06	8.31E-04
<i>NES</i>	ENSG00000132688	2.75	3.85	54.08	5.52E-08	3.16E-06	8.51E-04
<i>KIF5C</i>	ENSG00000168280	1.49	5.60	53.81	5.79E-08	3.31E-06	8.93E-04
<i>MPP6</i>	ENSG00000105926	1.37	3.13	81.79	6.50E-08	3.66E-06	1.00E-03
<i>TGIF2LX</i>	ENSG00000153779	5.15	-1.88	55.91	6.51E-08	3.66E-06	1.00E-03
<i>OXCT2P1</i>	ENSG00000237624	5.16	-2.02	53.12	6.52E-08	3.66E-06	1.01E-03

List of genes robustly upregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

<i>KCNJ2</i>	ENSG00000123700	2.62	2.79	52.73	6.99E-08	3.88E-06	1.08E-03
<i>RHBDF2</i>	ENSG00000129667	1.66	4.07	52.70	7.02E-08	3.88E-06	1.08E-03
<i>CD163L1</i>	ENSG00000177675	3.79	1.67	52.62	7.12E-08	3.92E-06	1.10E-03
<i>STARD13</i>	ENSG00000133121	1.04	6.18	67.07	7.25E-08	3.98E-06	1.12E-03
<i>RP11-245M24.1</i>	ENSG00000229563	3.48	0.30	52.21	7.65E-08	4.14E-06	1.18E-03
<i>EPHB1</i>	ENSG00000154928	2.74	2.87	52.21	7.65E-08	4.14E-06	1.18E-03
<i>MYO1D</i>	ENSG00000176658	4.27	2.06	52.16	7.72E-08	4.16E-06	1.19E-03
<i>RP11-297P16.4</i>	ENSG00000250920	5.59	1.88	51.82	8.20E-08	4.37E-06	1.26E-03
<i>DKK3</i>	ENSG00000050165	1.06	8.79	99.12	9.56E-08	5.03E-06	1.47E-03
<i>GCNT2</i>	ENSG00000111846	2.69	2.24	50.74	9.95E-08	5.22E-06	1.53E-03
<i>WDR66</i>	ENSG00000158023	2.25	1.82	50.40	1.06E-07	5.47E-06	1.63E-03
<i>CTH</i>	ENSG00000116761	1.66	3.15	50.03	1.13E-07	5.77E-06	1.74E-03
<i>SHC3</i>	ENSG00000148082	5.61	-0.73	49.89	1.16E-07	5.90E-06	1.79E-03
<i>ADCY2</i>	ENSG00000078295	2.20	-0.19	49.38	1.27E-07	6.33E-06	1.96E-03
<i>DTX2</i>	ENSG00000091073	1.16	4.20	77.54	1.35E-07	6.60E-06	2.08E-03
<i>TPST2</i>	ENSG00000128294	1.14	4.46	67.57	1.36E-07	6.63E-06	2.10E-03
<i>BEND7</i>	ENSG00000165626	1.58	3.38	47.92	1.67E-07	8.02E-06	2.57E-03
<i>ADRB1</i>	ENSG00000043591	2.25	0.83	45.83	2.48E-07	1.16E-05	3.82E-03
<i>SIM1</i>	ENSG00000112246	2.22	3.31	47.80	2.56E-07	1.19E-05	3.95E-03
<i>SOX6</i>	ENSG00000110693	2.42	1.83	45.46	2.66E-07	1.22E-05	4.11E-03
<i>SEPT6</i>	ENSG00000125354	1.03	5.55	53.26	2.74E-07	1.25E-05	4.23E-03
<i>CDH10</i>	ENSG00000040731	10.20	-1.03	47.36	2.78E-07	1.26E-05	4.28E-03
<i>ANKRD20A5P</i>	ENSG00000186481	1.84	2.67	45.03	2.89E-07	1.31E-05	4.46E-03
<i>CADM3</i>	ENSG00000162706	3.50	4.35	44.19	3.41E-07	1.52E-05	5.26E-03
<i>MARCH4</i>	ENSG00000144583	2.13	4.93	43.03	4.30E-07	1.86E-05	6.62E-03
<i>SH2D5</i>	ENSG00000189410	2.44	3.66	42.96	4.36E-07	1.87E-05	6.72E-03
<i>OTOGL</i>	ENSG00000165899	2.16	0.16	42.72	4.57E-07	1.96E-05	7.04E-03
<i>ANKRD18A</i>	ENSG00000180071	4.07	-0.47	44.09	5.05E-07	2.15E-05	7.79E-03
<i>CCRN4L</i>	ENSG00000151014	1.14	5.22	42.18	5.10E-07	2.16E-05	7.86E-03
<i>FRMD5</i>	ENSG00000171877	1.43	3.54	41.53	5.81E-07	2.39E-05	8.96E-03
<i>LINC00839</i>	ENSG00000185904	1.53	3.83	41.50	5.85E-07	2.40E-05	9.01E-03
<i>SRPX2</i>	ENSG00000102359	2.06	1.08	41.40	5.97E-07	2.44E-05	9.20E-03
<i>DUSP14</i>	ENSG00000161326	0.95	6.90	42.92	6.02E-07	2.45E-05	9.28E-03
<i>AC003051.1</i>	ENSG00000227517	4.94	-2.27	41.05	6.42E-07	2.59E-05	9.89E-03
<i>CTC-347C20.2</i>	ENSG00000248371	2.74	0.05	40.83	6.72E-07	2.68E-05	1.04E-02
<i>C10orf35</i>	ENSG00000171224	1.73	1.43	40.70	6.91E-07	2.75E-05	1.06E-02
<i>SDC1</i>	ENSG00000115884	1.61	5.47	40.55	7.11E-07	2.82E-05	1.10E-02
<i>STK40</i>	ENSG00000196182	0.96	6.00	65.43	7.38E-07	2.90E-05	1.14E-02
<i>RAB3B</i>	ENSG00000169213	1.37	8.53	40.13	7.77E-07	3.05E-05	1.20E-02
<i>SLC38A5</i>	ENSG00000017483	2.51	-1.45	39.94	8.08E-07	3.15E-05	1.25E-02
<i>NTF4</i>	ENSG00000225950	2.37	-0.55	39.89	8.16E-07	3.16E-05	1.26E-02
<i>PSG8</i>	ENSG00000124467	6.86	-1.29	41.42	8.44E-07	3.25E-05	1.30E-02
<i>CLMN</i>	ENSG00000165959	1.49	4.44	39.66	8.58E-07	3.28E-05	1.32E-02
<i>MAST4</i>	ENSG00000069020	1.26	3.01	42.13	8.83E-07	3.35E-05	1.36E-02
<i>FTSJ1</i>	ENSG00000068438	0.95	5.90	50.62	9.20E-07	3.47E-05	1.42E-02
<i>ANKRD30BP1</i>	ENSG00000175302	3.18	-0.31	39.23	9.38E-07	3.51E-05	1.45E-02
<i>POTEC</i>	ENSG00000183206	2.52	2.01	38.95	9.96E-07	3.72E-05	1.54E-02
<i>APLN</i>	ENSG00000171388	2.42	0.84	38.73	1.04E-06	3.87E-05	1.61E-02
<i>VEPH1</i>	ENSG00000197415	3.72	0.55	38.58	1.08E-06	3.95E-05	1.66E-02
<i>MATN2</i>	ENSG00000132561	1.20	6.17	38.47	1.10E-06	4.01E-05	1.70E-02

List of genes robustly upregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

<i>POLR3G</i>	ENSG00000113356	1.28	3.05	38.46	1.11E-06	4.01E-05	1.71E-02
<i>FAM133A</i>	ENSG00000179083	1.85	1.53	38.42	1.12E-06	4.03E-05	1.72E-02
<i>PORCN</i>	ENSG00000102312	1.63	5.02	38.38	1.12E-06	4.05E-05	1.73E-02
<i>PRPS1</i>	ENSG00000147224	0.99	7.12	38.21	1.17E-06	4.19E-05	1.80E-02
<i>NIPAL3</i>	ENSG00000001461	0.94	7.57	45.73	1.20E-06	4.30E-05	1.85E-02
<i>MYO7B</i>	ENSG00000169994	3.67	0.24	37.96	1.23E-06	4.39E-05	1.90E-02
<i>PSG5</i>	ENSG00000204941	3.21	3.35	37.87	1.26E-06	4.44E-05	1.94E-02
<i>PRSS23</i>	ENSG00000150687	1.09	9.66	37.77	1.28E-06	4.52E-05	1.98E-02
<i>MMP1</i>	ENSG00000196611	6.76	7.44	37.75	1.29E-06	4.53E-05	1.99E-02
<i>CTNNA1</i>	ENSG00000119326	0.92	6.93	73.46	1.31E-06	4.59E-05	2.02E-02
<i>LY6K</i>	ENSG00000160886	2.28	2.37	37.60	1.33E-06	4.64E-05	2.06E-02
<i>TNFRSF11A</i>	ENSG00000141655	2.46	2.12	37.28	1.43E-06	4.93E-05	2.20E-02
<i>ITGA6</i>	ENSG000000091409	1.58	7.58	37.26	1.43E-06	4.94E-05	2.21E-02
<i>SLAMF7</i>	ENSG000000026751	4.59	3.35	37.18	1.46E-06	5.02E-05	2.25E-02
<i>MOK</i>	ENSG00000080823	1.60	5.60	37.12	1.48E-06	5.07E-05	2.28E-02
<i>EMB</i>	ENSG00000170571	1.40	4.02	36.14	1.84E-06	6.19E-05	2.83E-02
<i>RNF144B</i>	ENSG00000137393	1.25	4.89	35.92	1.93E-06	6.45E-05	2.97E-02
<i>GALNT7</i>	ENSG00000109586	0.94	5.54	47.91	1.97E-06	6.57E-05	3.04E-02
<i>CDH4</i>	ENSG00000179242	9.34	0.75	38.83	2.02E-06	6.72E-05	3.12E-02
<i>TRIM36</i>	ENSG00000152503	1.51	3.55	35.69	2.03E-06	6.73E-05	3.13E-02
<i>PPP2R2B</i>	ENSG00000156475	4.63	2.18	37.03	2.06E-06	6.78E-05	3.17E-02
<i>PAQR5</i>	ENSG00000137819	1.28	4.73	35.62	2.06E-06	6.79E-05	3.18E-02
<i>RP11-14N7.2</i>	ENSG00000232527	2.04	0.89	35.60	2.07E-06	6.81E-05	3.20E-02
<i>FERMT1</i>	ENSG00000101311	1.38	1.52	35.60	2.14E-06	6.98E-05	3.30E-02
<i>ZNF804A</i>	ENSG00000170396	2.01	2.54	35.38	2.18E-06	7.07E-05	3.36E-02
<i>NUAK2</i>	ENSG00000163545	1.30	5.90	35.27	2.23E-06	7.22E-05	3.44E-02
<i>TOX</i>	ENSG00000198846	3.71	1.99	34.95	2.40E-06	7.72E-05	3.70E-02
<i>MAGEH1</i>	ENSG00000187601	1.18	3.18	57.54	2.49E-06	7.94E-05	3.84E-02
<i>EDN1</i>	ENSG00000078401	1.82	4.68	34.78	2.50E-06	7.95E-05	3.85E-02
<i>FJX1</i>	ENSG00000179431	1.91	4.03	34.41	2.72E-06	8.55E-05	4.19E-02
<i>RP4-773A18.4</i>	ENSG00000227811	1.54	0.27	38.10	2.79E-06	8.75E-05	4.30E-02
<i>SPATA13</i>	ENSG00000182957	1.11	3.64	35.61	2.81E-06	8.82E-05	4.34E-02
<i>CLCN4</i>	ENSG00000073464	1.37	5.40	34.09	2.92E-06	9.08E-05	4.50E-02
<i>MYLK</i>	ENSG00000065534	1.51	5.33	34.07	2.94E-06	9.11E-05	4.53E-02

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Gene Symbol	ENSEMBL ID	mean fold change	sd	Z score
<i>ARMC9</i>	ENSG00000135931	-3.15	0.32	-9.72
<i>KRT17</i>	ENSG00000128422	-10.98	1.26	-8.71
<i>SAMD9</i>	ENSG00000205413	-2.54	0.35	-7.24
<i>GDA</i>	ENSG00000119125	-11.90	1.66	-7.15
<i>PGBD3</i>	ENSG00000258838	-4.21	0.59	-7.11
<i>PGBD3</i>	ENSG00000243251	-4.09	0.58	-7.08
<i>BACH1</i>	ENSG00000156273	-2.20	0.32	-6.89
<i>ERCC6</i>	ENSG00000225830	-3.69	0.54	-6.78
<i>PAPPA2</i>	ENSG00000116183	-7.32	1.18	-6.21
<i>LPP</i>	ENSG00000145012	-1.72	0.28	-6.12
<i>PKP1</i>	ENSG00000081277	-10.09	1.73	-5.84
<i>RNF168</i>	ENSG00000163961	-1.35	0.23	-5.80
<i>WEE1</i>	ENSG00000166483	-2.91	0.50	-5.79
<i>Metazoa_SRP</i>	ENSG00000243869	-3.61	0.63	-5.73
<i>SLC7A5</i>	ENSG00000103257	-5.96	1.05	-5.66
<i>SRPK1</i>	ENSG00000096063	-2.21	0.41	-5.42
<i>CCDC81</i>	ENSG00000149201	-3.48	0.65	-5.37
<i>PLXNA3</i>	ENSG00000130827	-1.55	0.30	-5.23
<i>C15orf62</i>	ENSG00000188277	-6.62	1.28	-5.19
<i>ACPL2</i>	ENSG00000155893	-2.21	0.44	-4.97
<i>CYB5R3</i>	ENSG00000100243	-1.60	0.32	-4.91
<i>RFX7</i>	ENSG00000181827	-1.37	0.28	-4.91
<i>ACTG2</i>	ENSG00000163017	-7.68	1.57	-4.89
<i>DLGAP4</i>	ENSG00000080845	-1.61	0.33	-4.89
<i>CEACAM19</i>	ENSG00000186567	-2.75	0.56	-4.87
<i>GALNT1</i>	ENSG00000141429	-2.70	0.56	-4.85
<i>CCDC80</i>	ENSG00000091986	-3.06	0.63	-4.83
<i>CTB-85P21.2</i>	ENSG00000259787	-4.51	0.94	-4.82
<i>ADCY9</i>	ENSG00000162104	-1.77	0.37	-4.81
<i>DUSP4</i>	ENSG00000120875	-5.50	1.14	-4.81
<i>SOGA1</i>	ENSG00000149639	-1.82	0.38	-4.77
<i>RDH10</i>	ENSG00000121039	-4.06	0.86	-4.73
<i>SMURF2</i>	ENSG00000108854	-1.73	0.37	-4.73
<i>LIF</i>	ENSG00000128342	-6.92	1.48	-4.68
<i>AL021707.2</i>	ENSG00000257034	-1.07	0.23	-4.67
<i>FBN1</i>	ENSG00000166147	-2.77	0.59	-4.66
<i>SHOC2</i>	ENSG00000108061	-1.41	0.30	-4.65
<i>NMD3</i>	ENSG00000169251	-1.00	0.22	-4.64
<i>RP11-280F2.2</i>	ENSG00000242759	-3.06	0.66	-4.63
<i>OXTR</i>	ENSG00000180914	-5.75	1.25	-4.62
<i>TMEM132D</i>	ENSG00000151952	-11.28	2.49	-4.53
<i>PVR</i>	ENSG00000073008	-4.16	0.92	-4.53

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<i>HAS3</i>	ENSG00000103044	-2.34	0.52	-4.52
<i>OXSR1</i>	ENSG00000172939	-1.30	0.29	-4.49
<i>ABCC1</i>	ENSG00000103222	-4.39	0.98	-4.49
<i>KLHL5</i>	ENSG00000109790	-3.91	0.87	-4.48
<i>MYH9</i>	ENSG00000100345	-3.13	0.70	-4.48
<i>LAMC1</i>	ENSG00000135862	-2.75	0.61	-4.47
<i>XBP1</i>	ENSG00000100219	-1.71	0.38	-4.47
<i>RAP1GAP2</i>	ENSG00000132359	-2.51	0.56	-4.47
<i>RALGPS2</i>	ENSG00000116191	-5.53	1.24	-4.45
<i>CLIP1</i>	ENSG00000130779	-1.19	0.27	-4.45
<i>TLE4</i>	ENSG00000106829	-3.19	0.72	-4.44
<i>PGD</i>	ENSG00000142657	-1.99	0.45	-4.43
<i>PCK2</i>	ENSG00000100889	-2.43	0.55	-4.42
<i>FLNA</i>	ENSG00000196924	-2.80	0.64	-4.40
<i>PCDH7</i>	ENSG00000169851	-11.74	2.68	-4.39
<i>KCNK6</i>	ENSG00000099337	-2.81	0.65	-4.35
<i>ATXN1</i>	ENSG00000215019	-1.32	0.31	-4.32
<i>SLC12A6</i>	ENSG00000140199	-2.74	0.64	-4.32
<i>FADS3</i>	ENSG00000221968	-1.92	0.45	-4.31
<i>SSH1</i>	ENSG00000084112	-1.82	0.42	-4.31
<i>MED13</i>	ENSG00000108510	-1.14	0.26	-4.31
<i>ROBO2</i>	ENSG00000185008	-8.03	1.87	-4.30
<i>IL11</i>	ENSG00000095752	-5.78	1.35	-4.29
<i>GTPBP1</i>	ENSG00000100226	-1.02	0.24	-4.29
<i>PDIA5</i>	ENSG00000065485	-1.90	0.44	-4.29
<i>KRT7</i>	ENSG00000135480	-10.99	2.57	-4.28
<i>CREB5</i>	ENSG00000146592	-3.76	0.88	-4.26
<i>EP300</i>	ENSG00000100393	-1.06	0.25	-4.24
<i>CPEB2</i>	ENSG00000137449	-2.99	0.71	-4.23
<i>RP11-29G8.3</i>	ENSG00000261553	-3.19	0.76	-4.22
<i>LUZP2</i>	ENSG00000187398	-11.25	2.69	-4.19
<i>GPR156</i>	ENSG00000175697	-2.60	0.62	-4.18
<i>C5orf24</i>	ENSG00000181904	-1.87	0.45	-4.18
<i>SCAF11</i>	ENSG00000139218	-1.95	0.47	-4.17
<i>ZNF451</i>	ENSG00000112200	-1.39	0.33	-4.16
<i>VCL</i>	ENSG00000035403	-2.49	0.60	-4.15
<i>YARS</i>	ENSG00000134684	-2.87	0.69	-4.14
<i>SACS</i>	ENSG00000151835	-3.13	0.76	-4.12
<i>GLIPR1</i>	ENSG00000139278	-2.68	0.65	-4.12
<i>WARS</i>	ENSG00000140105	-2.33	0.57	-4.10
<i>RBFOX2</i>	ENSG00000100320	-1.49	0.36	-4.10
<i>PRKCA</i>	ENSG00000154229	-2.68	0.65	-4.09
<i>LCOR</i>	ENSG00000196233	-1.50	0.37	-4.09
<i>AC026806.2</i>	ENSG00000268913	-2.37	0.58	-4.08
<i>ALDH3A1</i>	ENSG00000108602	-6.84	1.68	-4.08

List of genes robustly downregulated by *NF2* inactivation in cultured arachnoidal cells in our expanded data set

<i>AMIGO2</i>	ENSG00000139211	-5.49	1.35	-4.07
<i>RAMP1</i>	ENSG00000132329	-6.58	1.62	-4.07
<i>TMEM65</i>	ENSG00000164983	-1.55	0.38	-4.07
<i>FERMT2</i>	ENSG00000073712	-2.97	0.73	-4.07
<i>SLC6A9</i>	ENSG00000196517	-3.54	0.87	-4.06
<i>CACNG4</i>	ENSG00000075461	-5.75	1.42	-4.06
<i>THOC6</i>	ENSG00000131652	-1.66	0.41	-4.05
<i>MAPK1</i>	ENSG00000100030	-1.40	0.35	-4.04
<i>FAM69A</i>	ENSG00000154511	-2.53	0.63	-4.04
<i>UBE2H</i>	ENSG00000186591	-1.02	0.25	-4.04
<i>KDM5B</i>	ENSG00000117139	-1.56	0.39	-4.03
<i>SCN3A</i>	ENSG00000153253	-10.28	2.56	-4.02
<i>RC3H2</i>	ENSG00000056586	-1.12	0.28	-4.02
<i>ADAMTS1</i>	ENSG00000154734	-4.30	1.07	-4.00
<i>C11orf87</i>	ENSG00000185742	-8.82	2.21	-3.99
<i>AHR</i>	ENSG00000106546	-4.27	1.07	-3.99
<i>STK38L</i>	ENSG00000211455	-2.17	0.54	-3.99
<i>FANCE</i>	ENSG00000112039	-3.26	0.82	-3.99
<i>CLCF1</i>	ENSG00000175505	-5.65	1.42	-3.98
<i>CPNE7</i>	ENSG00000178773	-6.91	1.74	-3.97
<i>MAN2A1</i>	ENSG00000112893	-2.09	0.53	-3.96
<i>NPTN</i>	ENSG00000156642	-1.38	0.35	-3.96
<i>FBXO30</i>	ENSG00000118496	-1.66	0.42	-3.95
<i>RP11-16M8.2</i>	ENSG00000246430	-5.51	1.40	-3.94
<i>AC144831.1</i>	ENSG00000261888	-4.02	1.02	-3.93
<i>GSK3B</i>	ENSG00000082701	-1.20	0.31	-3.93
<i>SYNC</i>	ENSG00000162520	-3.55	0.90	-3.93
<i>ZNF347</i>	ENSG00000197937	-1.96	0.50	-3.92
<i>UBASH3B</i>	ENSG00000154127	-4.74	1.21	-3.92
<i>IGFBP1</i>	ENSG00000146678	-10.96	2.80	-3.92
<i>MTHFD1L</i>	ENSG00000120254	-2.29	0.59	-3.89
<i>MYOCD</i>	ENSG00000141052	-9.34	2.40	-3.89
<i>UGDH</i>	ENSG00000109814	-3.80	0.98	-3.89
<i>ANK1</i>	ENSG00000029534	-6.38	1.64	-3.88
<i>MAFG-AS1</i>	ENSG00000265688	-2.24	0.58	-3.88
<i>FAT1</i>	ENSG00000083857	-2.75	0.71	-3.87
<i>TGFB1I1</i>	ENSG00000140682	-2.03	0.53	-3.87
<i>PPP3CA</i>	ENSG00000138814	-1.48	0.38	-3.87
<i>CCDC50</i>	ENSG00000152492	-1.24	0.32	-3.86
<i>ALDH1A3</i>	ENSG00000184254	-9.14	2.37	-3.86
<i>KCTD16</i>	ENSG00000183775	-5.60	1.46	-3.85
<i>NF2</i>	ENSG00000186575	-3.24	0.84	-3.84
<i>STAM</i>	ENSG00000136738	-1.53	0.40	-3.84
<i>LOXL3</i>	ENSG00000115318	-3.45	0.90	-3.84
<i>TXNRD1</i>	ENSG00000198431	-2.74	0.72	-3.83

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<i>SPIRE1</i>	ENSG00000134278	-1.74	0.46	-3.81
<i>NAP1L4P1</i>	ENSG00000177173	-1.98	0.52	-3.81
<i>QSOX1</i>	ENSG00000116260	-2.55	0.67	-3.81
<i>CD109</i>	ENSG00000156535	-5.43	1.43	-3.81
<i>MTHFD2</i>	ENSG00000065911	-2.71	0.71	-3.80
<i>DGKA</i>	ENSG00000065357	-1.04	0.27	-3.80
<i>GNAI1</i>	ENSG00000127955	-2.50	0.66	-3.79
<i>DOK1</i>	ENSG00000115325	-1.23	0.33	-3.78
<i>ASNS</i>	ENSG00000070669	-2.17	0.58	-3.77
<i>BAG2</i>	ENSG00000112208	-3.30	0.87	-3.77
<i>LNPEP</i>	ENSG00000113441	-3.24	0.86	-3.77
<i>SERAC1</i>	ENSG00000122335	-1.80	0.48	-3.77
<i>RP11-448G15.3</i>	ENSG00000261490	-2.53	0.67	-3.76
<i>SLC4A2</i>	ENSG00000164889	-1.48	0.40	-3.74
<i>MYADM</i>	ENSG00000179820	-3.35	0.90	-3.72
<i>CYP26B1</i>	ENSG00000003137	-5.46	1.47	-3.72
<i>VPS13A</i>	ENSG00000197969	-2.97	0.80	-3.71
<i>LOXL1-AS1</i>	ENSG00000261801	-2.69	0.72	-3.71
<i>MAP3K9</i>	ENSG00000006432	-3.15	0.85	-3.71
<i>SRD5A1</i>	ENSG00000145545	-2.40	0.65	-3.70
<i>MLF1</i>	ENSG00000178053	-1.86	0.50	-3.70
<i>SEC24D</i>	ENSG00000150961	-1.73	0.47	-3.69
<i>HCN2</i>	ENSG00000099822	-4.59	1.24	-3.69
<i>DGKH</i>	ENSG00000102780	-4.83	1.31	-3.69
<i>ERBB3</i>	ENSG00000065361	-5.61	1.52	-3.68
<i>ZC3H7B</i>	ENSG00000100403	-1.42	0.38	-3.68
<i>AC010761.8</i>	ENSG00000264577	-9.13	2.48	-3.68
<i>IARS</i>	ENSG00000196305	-1.62	0.44	-3.68
<i>FSTL1</i>	ENSG00000163430	-1.54	0.42	-3.68
<i>MMP1</i>	ENSG00000196611	-10.19	2.77	-3.68
<i>COL4A5</i>	ENSG00000188153	-3.07	0.84	-3.66
<i>PTPRK</i>	ENSG00000152894	-3.82	1.05	-3.66
<i>AKIRIN1</i>	ENSG00000174574	-1.23	0.34	-3.65
<i>SCARA3</i>	ENSG00000168077	-2.48	0.68	-3.65
<i>ADAMTS14</i>	ENSG00000138316	-5.34	1.47	-3.64
<i>REV3L</i>	ENSG00000009413	-1.84	0.51	-3.63
<i>LHX4</i>	ENSG00000121454	-7.93	2.18	-3.63
<i>CTTNBP2NL</i>	ENSG00000143079	-2.10	0.58	-3.62
<i>WNT2B</i>	ENSG00000134245	-3.43	0.95	-3.62
<i>DST</i>	ENSG00000151914	-2.02	0.56	-3.62
<i>COL1A1</i>	ENSG00000108821	-2.54	0.70	-3.62
<i>PVRL3</i>	ENSG00000177707	-2.36	0.65	-3.61
<i>AC013470.6</i>	ENSG00000236048	-1.80	0.50	-3.61
<i>SYNJ2</i>	ENSG00000078269	-2.63	0.73	-3.61
<i>TBC1D19</i>	ENSG00000109680	-1.75	0.48	-3.61

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<i>BICD1</i>	ENSG00000151746	-2.38	0.66	-3.60
<i>PPT2</i>	ENSG00000221988	-1.28	0.36	-3.59
<i>MAP4</i>	ENSG00000047849	-1.36	0.38	-3.59
<i>AC005544.1</i>	ENSG00000214167	-5.65	1.58	-3.59
<i>NDFIP2</i>	ENSG00000102471	-1.53	0.43	-3.59
<i>HSPG2</i>	ENSG00000142798	-1.99	0.56	-3.57
<i>SLC36A1</i>	ENSG00000123643	-2.57	0.72	-3.56
<i>PPP1R12A</i>	ENSG00000058272	-1.01	0.28	-3.56
<i>MICALL1</i>	ENSG00000100139	-2.90	0.82	-3.56
<i>C1orf198</i>	ENSG00000119280	-3.36	0.94	-3.56
<i>GLIS3</i>	ENSG00000107249	-5.96	1.68	-3.56
<i>TP53BP2</i>	ENSG00000143514	-1.06	0.30	-3.56
<i>TCF20</i>	ENSG00000100207	-1.19	0.34	-3.55
<i>ACTN1</i>	ENSG00000072110	-2.41	0.68	-3.54
<i>JOSD1</i>	ENSG00000100221	-1.25	0.35	-3.54
<i>N4BP2</i>	ENSG00000078177	-2.23	0.63	-3.54
<i>AMPH</i>	ENSG00000078053	-3.13	0.89	-3.53
<i>DUSP8</i>	ENSG00000184545	-4.28	1.21	-3.53
<i>ARHGAP29</i>	ENSG00000137962	-2.62	0.74	-3.52
<i>FAM114A1</i>	ENSG00000197712	-1.54	0.44	-3.52
<i>NCOA7</i>	ENSG00000111912	-2.89	0.82	-3.52
<i>TRAM2</i>	ENSG00000065308	-3.02	0.86	-3.51
<i>UBE2HP1</i>	ENSG00000253677	-2.32	0.66	-3.50
<i>AMER1</i>	ENSG00000184675	-1.19	0.34	-3.50
<i>MAFG</i>	ENSG00000197063	-1.50	0.43	-3.50
<i>SLC16A7</i>	ENSG00000118596	-7.62	2.18	-3.49
<i>ACTN4</i>	ENSG00000130402	-2.32	0.67	-3.48
<i>ZFHX4</i>	ENSG00000091656	-4.87	1.40	-3.48
<i>RNF217</i>	ENSG00000146373	-1.72	0.49	-3.48
<i>TUBA1A</i>	ENSG00000167552	-2.26	0.65	-3.47
<i>ABL2</i>	ENSG00000143322	-2.22	0.64	-3.47
<i>SYNJ1</i>	ENSG00000159082	-1.50	0.43	-3.47
<i>PLEKHG4</i>	ENSG00000196155	-2.35	0.68	-3.46
<i>PRR14L</i>	ENSG00000183530	-1.35	0.39	-3.46
<i>RP1-152L7.5</i>	ENSG00000216775	-3.63	1.05	-3.46
<i>ZBED4</i>	ENSG00000100426	-1.50	0.43	-3.46
<i>MAN1A2</i>	ENSG00000198162	-1.73	0.50	-3.46
<i>COMT</i>	ENSG00000093010	-1.34	0.39	-3.45
<i>KIF5B</i>	ENSG00000170759	-1.65	0.48	-3.45
<i>LASP1</i>	ENSG00000002834	-1.63	0.47	-3.45
<i>RBM15</i>	ENSG00000162775	-1.55	0.45	-3.44
<i>SLC17A5</i>	ENSG00000119899	-1.59	0.46	-3.43
<i>PLS3</i>	ENSG00000102024	-2.90	0.84	-3.43
<i>PTGS2</i>	ENSG00000073756	-6.34	1.85	-3.43
<i>GFPT1</i>	ENSG00000198380	-1.37	0.40	-3.42

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<i>DBN1</i>	ENSG00000113758	-1.38	0.40	-3.42
<i>SLC5A3</i>	ENSG00000198743	-3.39	0.99	-3.42
<i>XPO6</i>	ENSG00000169180	-1.05	0.31	-3.41
<i>WDR1</i>	ENSG00000071127	-2.06	0.60	-3.41
<i>NDEL1</i>	ENSG00000166579	-1.05	0.31	-3.40
<i>AC098614.2</i>	ENSG00000213846	-2.36	0.69	-3.40
<i>ADRB2</i>	ENSG00000169252	-3.62	1.07	-3.40
<i>CDC42EP1</i>	ENSG00000128283	-2.71	0.80	-3.39
<i>TMEM184B</i>	ENSG00000198792	-1.50	0.44	-3.39
<i>NEK7</i>	ENSG00000151414	-2.28	0.67	-3.39
<i>KIAA1586</i>	ENSG00000168116	-1.32	0.39	-3.39
<i>DDA1</i>	ENSG00000130311	-1.10	0.33	-3.38
<i>PCDH10</i>	ENSG00000138650	-9.84	2.91	-3.38
<i>NTN4</i>	ENSG00000074527	-4.11	1.22	-3.38
<i>SLC1A5</i>	ENSG00000105281	-3.40	1.01	-3.38
<i>AHNAK2</i>	ENSG00000185567	-5.03	1.49	-3.37
<i>CSRP2</i>	ENSG00000175183	-2.25	0.67	-3.37
<i>ARSJ</i>	ENSG00000180801	-5.69	1.69	-3.37
<i>RP4-671G15.3</i>	ENSG00000248201	-1.91	0.57	-3.37
<i>STAC</i>	ENSG00000144681	-9.15	2.72	-3.37
<i>LMO7</i>	ENSG00000136153	-3.26	0.97	-3.37
<i>RP11-360F5.3</i>	ENSG00000249685	-3.29	0.98	-3.37
<i>RGS4</i>	ENSG00000117152	-8.02	2.39	-3.36
<i>SLC4A7</i>	ENSG00000033867	-2.72	0.81	-3.36
<i>MTMR2</i>	ENSG00000087053	-1.16	0.35	-3.35
<i>SYT1</i>	ENSG00000067715	-7.77	2.32	-3.35
<i>CAPN5</i>	ENSG00000149260	-2.75	0.82	-3.35
<i>KLF6</i>	ENSG00000067082	-2.48	0.74	-3.35
<i>BDNF</i>	ENSG00000176697	-9.97	2.98	-3.35
<i>NEK10</i>	ENSG00000163491	-3.77	1.13	-3.34
<i>LOC124685</i>	ENSG00000228118	-2.24	0.67	-3.34
<i>THOC5</i>	ENSG00000100296	-1.51	0.45	-3.34
<i>PDLIM5</i>	ENSG00000163110	-2.36	0.71	-3.34
<i>TSHZ3</i>	ENSG00000121297	-1.70	0.51	-3.34
<i>COL4A1</i>	ENSG00000187498	-4.03	1.21	-3.34
<i>IPO5</i>	ENSG00000065150	-1.63	0.49	-3.34
<i>EPRS</i>	ENSG00000136628	-1.64	0.49	-3.33
<i>GS1-44D20.1</i>	ENSG00000254332	-2.66	0.80	-3.33
<i>COL5A2</i>	ENSG00000204262	-2.81	0.84	-3.32
<i>FAM132B</i>	ENSG00000178752	-6.88	2.07	-3.32
<i>CTIF</i>	ENSG00000134030	-1.56	0.47	-3.32
<i>TUFT1</i>	ENSG00000143367	-3.19	0.96	-3.32
<i>C22orf29</i>	ENSG00000215012	-1.84	0.56	-3.31
<i>PITPNB</i>	ENSG00000180957	-1.73	0.52	-3.31
<i>RICTOR</i>	ENSG00000164327	-1.24	0.38	-3.29

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<i>MICAL3</i>	ENSG00000243156	-1.77	0.54	-3.29
<i>RIMS1</i>	ENSG00000079841	-7.90	2.41	-3.29
<i>RP11-333E13.2</i>	ENSG00000250568	-1.70	0.52	-3.28
<i>TEAD1</i>	ENSG00000187079	-1.36	0.42	-3.28
<i>TFAP2A</i>	ENSG00000137203	-5.43	1.65	-3.28
<i>PPRC1</i>	ENSG00000148840	-1.36	0.41	-3.28
<i>ASB1</i>	ENSG00000065802	-1.57	0.48	-3.28
<i>ACTG1</i>	ENSG00000184009	-1.52	0.46	-3.28
<i>COL4A2</i>	ENSG00000134871	-3.77	1.15	-3.28
<i>LIMS1</i>	ENSG00000169756	-1.64	0.50	-3.27
<i>RP11-145M9.3</i>	ENSG00000181260	-3.15	0.97	-3.27
<i>PGM2L1</i>	ENSG00000165434	-2.47	0.76	-3.26
<i>AL021977.1</i>	ENSG00000256873	-1.58	0.49	-3.26
<i>DUSP5</i>	ENSG00000138166	-5.06	1.56	-3.26
<i>SGIP1</i>	ENSG00000118473	-4.03	1.24	-3.25
<i>TRIB1</i>	ENSG00000173334	-4.13	1.28	-3.24
<i>CYP51A1</i>	ENSG00000001630	-1.41	0.43	-3.24
<i>VPS13B</i>	ENSG00000132549	-1.31	0.41	-3.23
<i>IGF2BP3</i>	ENSG00000136231	-6.94	2.15	-3.23
<i>MYL12A</i>	ENSG00000101608	-1.63	0.51	-3.22
<i>LRRD1</i>	ENSG00000240720	-1.39	0.43	-3.22
<i>INHBA</i>	ENSG00000122641	-5.24	1.63	-3.21
<i>CSRP1</i>	ENSG00000159176	-1.51	0.47	-3.21
<i>PGRMC2</i>	ENSG00000164040	-1.19	0.37	-3.20
<i>MSNP1</i>	ENSG00000251593	-1.55	0.48	-3.20
<i>USP13</i>	ENSG00000058056	-2.21	0.69	-3.20
<i>TPM1</i>	ENSG00000140416	-2.17	0.68	-3.20
<i>DHRS9</i>	ENSG00000073737	-5.47	1.71	-3.20
<i>EDIL3</i>	ENSG00000164176	-7.27	2.28	-3.19
<i>TERT</i>	ENSG00000164362	-10.58	3.32	-3.18
<i>GPRC5A</i>	ENSG00000013588	-6.20	1.95	-3.18
<i>ODC1</i>	ENSG00000115758	-1.78	0.56	-3.18
<i>EPHA5</i>	ENSG00000145242	-11.75	3.70	-3.18
<i>ZNF469</i>	ENSG00000225614	-2.66	0.84	-3.17
<i>ENTPD7</i>	ENSG00000198018	-2.27	0.72	-3.17
<i>FMR1</i>	ENSG00000102081	-1.07	0.34	-3.17
<i>PDLIM3</i>	ENSG00000154553	-4.23	1.33	-3.17
<i>DPY19L1</i>	ENSG00000173852	-1.26	0.40	-3.17
<i>TCF7</i>	ENSG00000081059	-3.26	1.03	-3.17
<i>CTD-3252C9.4</i>	ENSG00000267519	-3.25	1.03	-3.16
<i>PALLD</i>	ENSG00000129116	-3.51	1.11	-3.16
<i>KCNH1</i>	ENSG00000143473	-6.21	1.96	-3.16
<i>OSR2</i>	ENSG00000164920	-8.36	2.65	-3.16
<i>AVEN</i>	ENSG00000169857	-1.54	0.49	-3.16
<i>ADAMTS8</i>	ENSG00000134917	-7.68	2.43	-3.16

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<i>TUBA4A</i>	ENSG00000127824	-3.25	1.03	-3.16
<i>RBMS2</i>	ENSG00000076067	-1.21	0.38	-3.16
<i>DSEL</i>	ENSG00000171451	-1.77	0.56	-3.15
<i>CSGALNACT2</i>	ENSG00000169826	-1.16	0.37	-3.15