

**Stronger inflammatory/cytotoxic T cell response in women identified by  
microarray analysis**

Anura Hewagama, Dipak Patel, Sushma Yarlagadda, Faith M. Strickland, Bruce C. Richardson.

Department of Internal Medicine, Rheumatology Division, The University of Michigan, 109  
Zina Pitcher Pl., Ann Arbor, MI, 48109, USA.

**Running Title: Gender differences in T cell gene expression**

**Correspondence:** Dr. Bruce C. Richardson, 3007 BSRB. Ann Arbor, MI 48109-2200

Ph. 734-763-6940.

FAX: 734-936-9220

E-mail: brichard@umich.edu

## **ABSTRACT**

Women develop chronic inflammatory autoimmune diseases like lupus more often than men. The mechanisms causing the increased susceptibility are incompletely understood, although estrogen is believed to contribute. Chronic immune stimulation characterizes many autoimmune disorders. We hypothesized that repeated stimulation may cause a different T cell immune response in women than men. Microarray approaches were used to compare gene expression in T cells from healthy men and women with and without repeated stimulation. Four days following a single stimulation only 25% of the differentially expressed, gender-biased genes were expressed at higher levels in the women. In contrast, following restimulation 72% were more highly expressed in women. Immune response genes were significantly over-represented among the genes upregulated in women, and among the immune response genes, the inflammatory/cytotoxic effector genes interferon gamma (IFNG), lymphotoxin beta (LTB), granzyme A (GZMA), interleukin-12 receptor beta2 (IL12RB2), and granulysin (GNLY) were among those overexpressed to the greatest degree. In contrast, IL17A was the only effector gene more highly expressed in men. Estrogen response elements were identified in the promoters of half of the overexpressed immune genes in women, and in <10% of the male biased genes. The differential expression of inflammatory/cytotoxic effector molecules in restimulated female T cells may contribute to the differences in autoimmune diseases between women and men.

Key Words: Interferon, granzyme A, granulysin, lymphotoxin B, autoimmunity, gender.

## Introduction

Genetic factors predispose to autoimmunity, and one of the strongest predisposing factors is female sex. Systemic lupus erythematosus (SLE), scleroderma, and rheumatoid arthritis are among the autoimmune diseases more prevalent in women than men<sup>1</sup>. Why women are more prone to autoimmunity is not completely understood. Estrogen likely contributes to the increased susceptibility and severity of autoimmunity in women<sup>2</sup> and some immune genes have estrogen response elements<sup>3</sup>. However, estrogen does not completely explain the female predisposition to autoimmunity. Female predominant diseases like SLE also occur more often in prepubertal girls than boys<sup>4</sup>, and cytokine responses are different between boys and girls 1-3 years of age<sup>5</sup>, suggesting a role for non-hormonal factors in the female predilection to autoimmunity. Having two X chromosomes may also predispose women to autoimmunity<sup>6</sup>, although which X chromosome genes are overexpressed in women to promote autoimmunity is also unclear. Finally, recent studies suggest that sex-specific differences in the regulation of autosomal genes independent of estrogen may also contribute to gender-specific diseases<sup>1</sup>. What these genes are is also unknown.

T cells are critical to the development of many forms of autoimmunity. T cells are sufficient to cause lupus-like autoimmunity in animal models<sup>7,8</sup>, and T cell responses are implicated in the pathogenesis of human lupus<sup>9</sup>, rheumatoid arthritis<sup>10</sup> and other autoimmune diseases<sup>11</sup>. Further, the differentiation of T cells into distinct subsets such as Th1, Th2, Th17, naïve, memory, regulatory (Treg) and others, each with distinct functions, suggests that gender-specific differences in T cell gene expression, perhaps due to gender-specific subset differentiation, could also contribute to the female predisposition to autoimmunity. The repeated T cell stimulation that occurs in chronic autoimmunity could promote differentiation into subsets with distinct repertoires in men and women.

We hypothesized that T cells from men and women express different levels or repertoires of effector molecules under conditions of repeated stimulation such as that occurring in chronic relapsing autoimmune diseases. As an initial test of this hypothesis we used expression microarrays to compare gene expression patterns in T cells from healthy young men and women following two rounds of stimulation. Differentially expressed immune genes were identified, and overexpression of effector molecules was validated by RT-PCR and protein analyses. The overexpressed genes were further analyzed for estrogen response elements as well as chromosomal location.

## Results

### *Gene expression in stimulated and restimulated male and female T cells.*

PBMC from 3 pairs of healthy men and women were stimulated with PHA, cultured for 4 days, then restimulated or not with PMA and ionomycin. Six hours later T cells were purified and gene expression compared using microarrays. Using the Genomatix ChipInspector program and a false discovery rate (FDR) of 4%, analysis of the un-restimulated T cells revealed a total of 6295 significantly up or down regulated probes, corresponding to 305 distinct transcripts that were differentially expressed between women and men. With a FDR of 4%, approximately 12 of the 305 genes are expected to be false-positive. Interestingly, men overexpressed more genes than women 4 days following the single stimulation. The men overexpressed 228 of the 305 genes (75%), while 77 of the 305 genes (25% of the total) were female biased.

In contrast, when the T cells were restimulated and gene expression similarly compared, a total of 24791 probes were significantly up or down regulated, corresponding to 1953 differentially expressed genes, of which 74 are expected to be false positives. Also in contrast to the un-restimulated cells, 1408 (72%) of the dimorphic genes were female biased while 545 (28%) were male biased, indicating a greater response in the female cells. Lists of the sexually dimorphic genes in unrestimulated and restimulated T cells are shown in Supplemental Tables S1 and S2.

Figure 1 illustrates the distribution of the sexually dimorphic genes, categorized by the relative magnitude of the difference in expression (fold change 1-1.2, 1.21-1.5, 1.51-2.0, and >2.0) in unrestimulated and restimulated T cells. In this figure a positive number is used to indicate a greater increase in T cells from women, while a negative number indicates a greater increase in T cells from men. Regardless of the sex of the donor, the majority of the sexually dimorphic genes had a fold change difference in the range of 1.2-1.5.

Quality controls included comparison of gender-specific sex chromosome gene transcript levels. XIST (X (inactive)-specific transcript) is expressed exclusively from the inactive X in women, and was among the most strongly female biased genes (7.9 fold increase relative to men). Similarly, the Y chromosome genes EIF1AY (fold increase 6.7 men/women), and RPS4Y (fold increase 15.5 men/women) were among the male biased genes with greatest differences (Supplementary Tables S1 & S2). The majority of the remaining differentially expressed genes were localized to autosomal chromosomes.

The functional significance of the differentially expressed genes was estimated using Gene Ontology (GO) terms. Since the magnitude of the biologic effect is likely to be proportional to the magnitude of the difference in immune effector molecule levels, those genes with a  $\geq 1.4$ -fold difference in the level of expression between the sexes were analyzed as likely to be most reflective of functional differences. Using this criterion, 109 of the 305 unrestimulated transcripts, and 289 of the 1953 restimulated transcripts, were classified by GO terms. The broad Biological Process filter identified 95 differentially expressed genes in the unrestimulated cells, and 249 in the restimulated cells. These genes were then analyzed for GO subcategories. The GO categories were only considered significant if they contained at least 4 genes and their Z-score was  $\geq 1.65$ , corresponding to  $p \leq 0.05$ , or inclusion in the top 5% of overrepresented genes.

Gender specific differences in restimulated T cell gene expression were found in multiple GO categories. The categories are shown in Table 1, ranked by the number of genes included in each relative to restimulated female T cells, which contained the greatest number of genes affected. The 150 female-biased biological process gene transcripts were most significantly ( $Z \geq 4$ ) overrepresented in the following GO classifications: response to stimulus, immune response, immune system process, and signal transduction (Table 1). In contrast, only cell communication and immune system process were enriched to this degree among the male biased genes in the restimulated cells. In unrestimulated cells, the categories of response to stimulus, cell differentiation, immune system process, immune response, cell death and apoptosis were highly ( $Z > 4$ ) enriched in the women, while only immune system process and immune response were enriched to this degree in the men.

The 3 categories with the greatest enrichment in restimulated T cells were all in women. In descending order these were “response to stimulus”, “immune response”, and “immune system process”. Genes in the category “immune response” were enriched in restimulated T cells from women relative to men (Z scores 5.68 in women vs 3.79, 20 vs 11 genes in men), and “immune system process” was also enriched in women (Z scores 4.7 vs 4.09, 21 vs 15 genes, women vs men).

The GO functional subcategories of genes involved in immune function are shown in Table 2, again ranked by number of genes identified. The top 4 categories for both men and women were “immune system process”, “immune response”, “response to external stimulus” and “defense response”, and all contained more genes and were more significantly enriched in restimulated T cells from women than the men. The categories “regulation of immune system process”, “immune system development” and “innate immune response” were approximately equal in men and women, but contained relatively few genes (4-5) in both sexes. Due to low numbers of genes, further sub-grouping of immune genes was not meaningful for the list of genes from unstimulated cells. The immune genes in the category “response to stimulus” were largely overlapping with these groups, and are shown in Supplementary Table S3 for the interested reader.

Sexually dimorphic genes from the “immune response” category with a  $\geq 1.4$  fold difference in expression between T cells from women and men are listed in Tables 3 and 4 respectively. Twenty genes exhibited female-biased expression (Table 3) while 11 genes exhibited male-biased expression (Table 4). Interestingly the women expressed higher levels of the pro-inflammatory/cytotoxic effector molecules granzyme A, IFN- $\gamma$ , granzyme A, and lymphotoxin- $\beta$ , as well as IL-12 receptor  $\beta 2$  involved in Th1 responses (Table 3). In contrast, men only overexpressed the pro-inflammatory cytokine IL17A, and had higher levels of the Th2 cytokines IL5 and IL10 (Table 4). The women also had higher levels of the chemokines CX3CL1, CX3CL2 and the cytokines IL1F5 and IL16, while men had higher levels of the chemokines XCL1, CXCL9 and CXCL10.

Sex hormones regulate gene expression and may play an important role in predisposing women to autoimmunity<sup>12</sup>. We therefore analyzed the gender-specific genes for estrogen response elements. Ten of the 20 female biased immune gene promoters exhibited estrogen response element family (EREF) binding sites in the promoter region (Table 3), suggesting that some, but not all genes differentially expressed in women may be directly influenced by hormone levels. In contrast, only 1 of the 11 male biased genes had an EREF binding site (Table 4).

We also considered the possibility that X chromosome genes may be overexpressed in women due to processes such as X chromosome demethylation or skewing, as has been reported in some female-predominant autoimmune diseases<sup>6, 13</sup>. However, none of the immune genes overexpressed in restimulated T cells were encoded on the X chromosome (Table 3).

#### Validation of gender-biased genes.

As noted above, the pro-inflammatory/cytotoxic molecules IFNG, GNLY, IL12RB2, GZMA and LTBA were among the female-biased immune genes detected by the microarrays. The microarray results were validated by comparing levels of these transcripts in restimulated CD4+ and CD8+

cells from 10 pairs of healthy men and women. PBMC were similarly isolated from the men and women, stimulated with PHA, then restimulated for 6 hours with PMA + ionomycin on day 4 as before. CD4<sup>+</sup> and CD8<sup>+</sup> T cells were then purified, and LTB, IFNG, IL12RB2, GZMA and GNLY transcripts measured by quantitative RT-PCR. mRNA levels of all 5 genes were significantly higher in women compared to men. LTB expression was significantly higher ( $p = 0.01$ ) in women in both CD4<sup>+</sup> and CD8<sup>+</sup> cells (Fig. 2A). Restimulation similarly caused a female-specific increase in IFNG expression in both CD4<sup>+</sup> ( $p=0.01$ ) and CD8<sup>+</sup> ( $p =0.05$ ) cells (Fig 2B). Significant ( $p=0.02$ ) female-biased expression of IL12RB2 was also seen in both CD4<sup>+</sup> and CD8<sup>+</sup> cells (Fig 2C), and GZMA similarly exhibited higher expression levels in women for both CD4<sup>+</sup> ( $p= 0.05$ ) and CD8<sup>+</sup> ( $p = 0.01$ ) T cells (Fig 2D). GNLY was expressed at higher levels in CD8<sup>+</sup> than CD4<sup>+</sup> cells, although statistically female-biased expression was observed in both CD4<sup>+</sup> ( $p=0.02$ ) and CD8<sup>+</sup> ( $p=0.03$ ) T cells (Fig 2E). Figure 2F confirms that men overexpress IL17A in CD4<sup>+</sup> ( $p=0.02$ ) but not CD8<sup>+</sup> T cells relative to women.

The same restimulation protocol was used to compare LTB, IL12RB2, and IFN- $\gamma$  protein levels in T cells from men and women. LTB and IL12RB2 were quantitated by immunoblotting using protein isolated from the same restimulated CD4<sup>+</sup> and CD8<sup>+</sup> T cells used for the experiments shown in Fig 2, while IFN- $\gamma$  was measured by ELISA in the supernatants of serially restimulated T cell aliquots from 4 additional men and women. Figure 3A shows that women have greater levels of LTB in restimulated CD4<sup>+</sup> and CD8<sup>+</sup> T cells relative to the men, and Figure 3B confirms a similar increase in IL12RB2 in CD4<sup>+</sup> and CD8<sup>+</sup> T cells in women relative to men. Figure 3C shows that female T cells secreted greater amounts of IFN- $\gamma$  relative to the men, with the greatest secretion on day 3 following the initial stimulation ( $p = 0.004$  by ANOVA).

## Discussion

Microarray approaches have demonstrated sexually dimorphic gene expression in mouse liver, adipose tissue, brain and muscle<sup>14</sup>. To the best of our knowledge though, the present studies represent the first use of microarrays to compare T cell gene expression between men and women, particularly under conditions of repeated stimulation. Following restimulation, T cells from women overexpressed a greater number of genes than T cells from men, and the inflammatory/cytotoxic effector molecules IFNG, GNLY, GZMA, IL12RB2 and LTB were the among the most highly overexpressed (1.4-1.8 times higher than men). Overexpression of these genes was confirmed in a separate cohort of men and women using RT-PCR as well as immunoblotting and ELISAs.

In contrast, the only pro-inflammatory gene overexpressed to the same degree in restimulated T cells from men was IL17A (1.4 times higher than in women). IL17 defines a pro-inflammatory T cell subset found in autoimmune diseases like rheumatoid arthritis and multiple sclerosis<sup>15</sup> and could contribute to the pathogenesis of these conditions in men, although these diseases still have a female predominance<sup>1</sup>. Interestingly, the arrays also indicted overexpression of the anti-inflammatory Th2 gene IL10 and the Th2 cytokine IL5 in men (1.5-fold relative to women), suggesting a more mixed T cell effector response in men. In support of this, UV-induced immune suppression is greater in men, and mediated by IL-10<sup>16</sup>. Overall, these results suggest a greater inflammatory/cytotoxic T cell response in restimulated T cells from women than men.

Sex-specific differences in gene expression are not unique to humans or the immune system. Sex-specific differences in autosomal gene regulation have also been described in worms, flies, fish, rodents and primates. Others have observed that sex-biased genes tend to evolve rapidly at the DNA sequence level<sup>17</sup>, and differences in gene regulation between sexes tend to be evolutionarily conserved<sup>1,18,19</sup> implying functional importance. Such differences have been proposed to contribute to other gender-specific diseases such as hypertension and schizophrenia<sup>1</sup>. Women may also be predisposed to some diseases due to gender-related differences in exposure to environmental agents, differences in metabolism of exogenous substances, and to differences in behavior<sup>20</sup>. Sex specific differences in T cell gene regulation such as those reported here and by others<sup>1</sup> likely also contribute to the development of autoimmunity in women. Why women might have evolved a more inflammatory T cell response is unclear. However, a stronger inflammatory response during the years of peak estrogen levels may help women resist infections during their peak childbearing years as proposed by others<sup>21</sup>.

The mechanisms causing differential T cell gene expression between men and women are not completely understood, but estrogen likely plays a role. In the present studies half the highly expressed gender-biased genes in restimulated female T cells had an EREB, suggesting that estrogen contributes directly to the overexpression in some of the genes detected. Further, estrogen receptor- $\alpha$  (ER- $\alpha$ ) can also exert its effects indirectly by binding transcription factors such as AP-1 or SP1, or by forming signaling complexes at the plasma membrane with proteins such as Src<sup>22</sup>, and so could contribute to overexpression of the female biased genes lacking an EREB.

T cells also differentiate throughout life into subsets such as Th1, Th2, Th17, Treg, naïve, memory and others, and gender-biased differentiation could potentially contribute differences in gene expression in women. In support of this, others have reported that healthy women have greater numbers of CD4+CD45RO+ “memory” T cells<sup>23</sup>, which are functionally diverse and can develop within 72 hours<sup>24</sup>, thus potentially contributing to a difference in gene expression between women and men such as that observed in the present study. However, to date no study as systematically tested whether estrogen alters T cell repertoire or alters thymic deletion of autoreactive T cells<sup>22</sup>.

Other mechanisms proposed for female biased autoimmunity include X chromosome skewing, which characterizes some forms of female-biased autoimmunity such as thyroiditis<sup>6</sup>, and reactivation of immune genes on the silenced X chromosome<sup>13</sup>. However, none of the highly expressed gender biased genes detected in this study were encoded on the X chromosome, arguing against these mechanisms occurring in normal women.

In summary, these studies indicate that T cell responses can differ between men and women particularly when restimulated. The overexpression of inflammatory/cytotoxic effector molecules in women could contribute to the development and severity of autoimmune diseases such as lupus in women.

## **Materials and Methods**

**Subjects.** Healthy men and women ages 25-35 years were recruited by advertising from the general population at the University of Michigan (Ann Arbor, MI). All procedures involving

human subjects were reviewed and approved by the University of Michigan Institutional Review Board for Human Subject Research.

**Cell culture.** PBMC were isolated from venous blood of pairs of age and racially matched healthy donors using Ficoll-Paque (GE Healthcare, Uppsala, Sweden) density gradient centrifugation, stimulated with 1  $\mu$ g/ml phytohemagglutinin (PHA) (Remel, Lenexa, KS) and cultured at 37°C in a 5% CO<sub>2</sub> balanced air atmosphere in RPMI 1640 media (Hyclone, Logan, UT) supplemented with 10% FBS (Gibco, Grand Island NY), 100 U/ml penicillin (Gibco) and 100 $\mu$ g/ml streptomycin. At the times indicated, the cells were washed and restimulated or not with 10ng/ml PMA (Sigma Chemical Co, St Louis, MO) and 1 $\mu$ g/ml ionomycin (Sigma). Six hours later the CD4<sup>+</sup> and CD8<sup>+</sup> cells were isolated using magnetic bead selection (Miltenyi Biotech, Auburn, CA) for gene expression assays.

**RNA and protein isolation.** T cell RNA was extracted with the Qiagen RNAeasy Mini kit (Valencia CA) and the RNase-free DNase set following the manufacturer's instructions. For simultaneous RT-PCR and the protein analysis, DNA, RNA, and protein were purified from CD4<sup>+</sup> and CD8<sup>+</sup> T cells using the Qiagen All Prep DNA/RNA/Protein Mini Kit according to manufacturer's instructions.

**Microarray analyses.** RNA samples were analyzed on Affymetrix (Santa Clara, CA) GeneChip Human Genome Plus 2.0 (HG-133 Plus 2.0) microarrays by the University of Michigan Comprehensive Cancer Center (UMCCC) Affymetrix and Microarray Core Facility (<http://www.umich.edu/~caparray/>). The resulting data were then analyzed using the Genomatix (<http://www.genomatix.de>) ChipInspector program. Differential gene expression was detected using men as the control, and a false discovery rate (FDR)  $\leq$  4% was applied to identify differentially expressed genes. Microarray data mining was performed using BiblioSphere, Gene2Promoter and GEMS-Launcher applications of the Genomatix software suite, Gene Ontology (GO) classifications were performed using the BiblioSphere Biological Process filter. To identify potential Estrogen Response Elements Family (EREF) binding sites, promoter sequences flanking the transcriptional start sites (-500 kbp to + 100 bp) were extracted using Gene2Promoter and queried for potential ER sites.

**Real Time quantitative PCR.** The RNA from the isolated CD4<sup>+</sup> and CD8<sup>+</sup> cells converted to cDNA synthesis with the Invitrogen (Carlsbad, CA) SuperScript first strand synthesis kit then the cDNA was subjected to real-time PCR. Roche (Basle) FastStart universal SYBR green master mix containing 1 $\mu$ l template cDNA and 0.5 $\mu$ M forward and reverse primers in a total volume of 20  $\mu$ l was annealed at 56 °C for a total of 40 cycles. The fold change of expression was calculated using  $\beta$ -actin as an internal reference gene. The gene-specific primers used to are shown in Table 5.

**Immunoblotting.** Protein was isolated using an Qiagen All-Prep kit, resuspended in 5% SDS/water and quantitated by absorbance at 280nm using a Nanodrop spectrophotometer (Nanodrop Technologies Willington, DE). Ten to 20  $\mu$ g of protein/sample was loaded onto a discontinuous 5-15% gradient SDS-PAGE gel (Bio-Rad, Los Angeles, CA). Following electrophoretic separation, the proteins were transferred to polyvinylidene difluoride (PVDF) filter membranes (Millipore, Bedford, MA) and blocked with 5% non-fat milk (Carnation,



Glendale, CA) in 20mM Tris-buffered saline containing 0.05% Tween-20 (TBST) buffer overnight at 4°C. The membrane was washed thrice with TBST then incubated with primary antibody overnight at 4°C. The following antibodies from Santa Cruz Biotechnology (Santa Cruz, CA) were used at a 1:200 dilution in 5% non-fat dry milk in TBST: Goat anti-actin (SC1616), goat anti-LTB (SC23561), goat anti-IL12Rb2 (SC18648), and goat anti-granulysin (SC16968). Binding of the primary antibodies was detected using a 1:2,000 horseradish peroxidase-conjugated donkey anti-goat (Santa Cruz). Signal detection was performed with SuperSignal chemiluminescent substrate (Pierce, Rockford, IL) and X-Omatic X-ray film following the manufacturer's instructions. For densitometry analysis, protein profiles were digitized using Canoscan (Canon, Lake Success, NY) software followed by quantification of the bands using UN-SCAN-IT gel 6.1 software (Silk Scientific, Orem, UT). The protein bands were then normalized to the  $\beta$ -actin band.

**ELISAs.** Secreted IFN- $\gamma$  was measured using a BD Pharmingen (San Jose CA) OPTI-EIA Human Gamma Interferon ELISA kit and reference recombinant human IFN- $\gamma$  according to the manufacturer's instructions.

**Statistical analysis.** Apart from microarray analyses, Student's *t*-or and ANOVA as appropriate were used to determine the significance of differences between groups. Results are presented as the mean  $\pm$  SEM.

#### **Acknowledgements**

The authors thank Ms. Cindy Bourke for her expert secretarial assistance. This work was supported by PHS grants AR42525, AG25877 and ES015214, and a Merit grant from the Dept. of Veterans Affairs.

**Supplementary information is available at the *Genes & Immunity's* website (<http://www.nature.com/gene/index.html>)**

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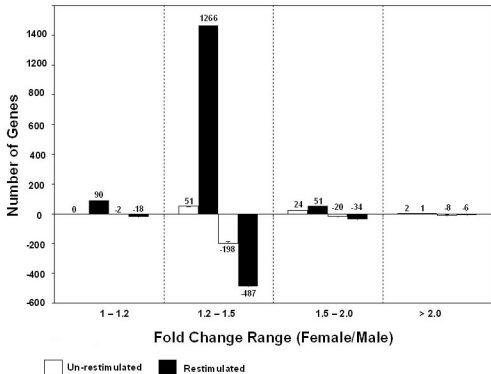
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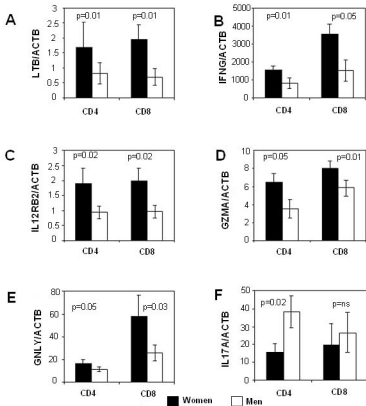
## TITLES AND LEGENDS TO FIGURES

**FIGURE 1.** *Expression profile of T cell genes differentially expressed between men and women.* Bars shown greater than zero represent the numbers of genes expressed at higher levels in women than men, while the negative values represent the numbers of genes expressed more highly in men. Error bars represent the FDR of 4%.

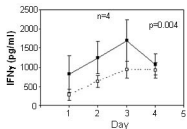
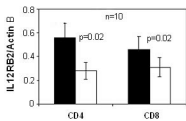
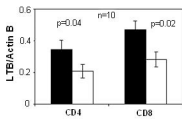
**FIGURE 2.** *Expression levels of pro-inflammatory transcripts in restimulated T cells from men and women.* PBMC from 10 racially matched male-female pairs were stimulated with PHA, cultured 4 days, then restimulated for 6 hours with PMA + ionomycin. CD4+ and CD8+ T cells were isolated and expression levels of (A) LTB, (B) IFNG, (C) IL12RB2, (D) GZMA, (E) GNLY and (F) IL17A were measured by qRT-PCR relative to  $\beta$ -actin. Results are presented as the mean $\pm$ SEM of the 10 determinations per group. Dark bars represent transcript levels in the women, and light bars transcript levels in the men.

**FIGURE 3.** *LTB, IL12RB2 and IFN- $\gamma$  protein levels in restimulated T cells from men and women.* (A) LTB and (B) IL12RB2 were measured by immunoblotting in the same restimulated CD4+ and CD8+ cells shown in figure 2. Results again are presented as the mean $\pm$ SEM of the 10 determinations per group. (C) IFN- $\gamma$  release by similarly restimulated T cells from 4 additional racially matched male-female pairs was measured by ELISA on the days indicated. Results again represent the mean $\pm$ SEM of the 4 determinations per group.









■ Women □ Men

## Tables

**Table 1: Major GO-rankings for genes differentially expressed between women and men**

Term	GoID	Unrestimulated				Stimulated			
		Female Higher		Male Higher		Female Higher		Male Higher	
		No of Genes	Z score	No of Genes	Z score	No of Genes	Z score	No of Genes	Z score
biological process	GO:0008150	55	2.71	40	2.26	150	5.5	99	3.21
cellular metabolic process	GO:0044237	35	2.85	17	-0.17	78	2.28	56	1.49
signal transduction	GO:0007165	18	2.16	10	0.64	53	4.59	31	2.41
<b>response to stimulus</b>	<b>GO:0050896</b>	<b>21</b>	<b>4.81</b>	<b>11</b>	<b>2.21</b>	<b>49</b>	<b>6.32</b>	<b>22</b>	<b>1.92</b>
cell communication	GO:0007154	21	2.65	10	0.29	36	2.97	60	4.4
transcription	GO:0006350	6	-0.71	7	0.56	30	2.15	15	0.15
regulation of gene expression	GO:0010468	6	-0.83	7	0.44	28	1.45	17	0.53
cell differentiation	GO:0030154	17	4.46	7	1.16	25	2.11	19	2.26
intracellular signaling cascade	GO:0007242	9	1.87			22	3.35	15	2
<b>immune system process</b>	<b>GO:0002376</b>	<b>10</b>	<b>4.1</b>	<b>9</b>	<b>4.67</b>	<b>21</b>	<b>4.7</b>	<b>15</b>	<b>4.09</b>
<b>immune response</b>	<b>GO:0006955</b>	<b>9</b>	<b>4.45</b>	<b>8</b>	<b>4.91</b>	<b>20</b>	<b>5.68</b>	<b>11</b>	<b>3.79</b>
cell surface receptor linked signal transduction	GO:0007166	6	0.48	4	0.2	19	1.67	14	1.67
cell death	GO:0008219	11	4.68	5	1.91	15	2.52	14	3.65
apoptosis	GO:0006915	10	4.34	4	1.36	13	2.04	12	3.03

Gene sets with fold change  $\geq 1.4$  were analyzed using Genomatix BiblioSphere software to identify overrepresented GO groups.

**Table 2. GO analysis of immune genes**

Term	GoID	Female Higher		Male Higher	
		No of Genes	Z score	No of Genes	Z score
immune system process	GO:0002376	21	4.70	15	4.09
immune response	GO:0006955	20	5.68	11	3.79
response to external stimulus	GO:0009605	18	4.90	10	2.84
defense response	GO:0006952	14	3.84	10	3.34
regulation of immune system process	GO:0002682	5	2.71	4	2.76
immune system development	GO:0002520	4	1.58	4	2.40
innate immune response	GO:0045087	4	2.83	-	-

**Table 3. Female-biased immune genes with fold change  $\geq 1.4$** 

Gene Symbol	Gene ID	Locus	Gene Name	Fold	EREF
IFNG	3458	12q14	interferon, gamma	1.8	N
GZMA	3001	5q11	granzyme A(cytotoxic T-lymphocyte-associated serine esterase 3)	1.7	N
IL12RB2	3595	1p31	interleukin 12 receptor, beta 2	1.7	N
GNLY	10578	2p11	granulysin	1.7	Y
IL1F5	26525	2q14	interleukin 1 family, member 5 (delta)	1.5	Y
CX3CL1	6376	16q13	chemokine (C-X3-C motif) ligand 1	1.5	N
MIST	116449	4p16	mast cell immunoreceptor signal transducer	1.5	N
LTB	4050	6p21	lymphotoxin beta (TNF superfamily, member 3)	1.4	Y
TRAT1	50852	3q13	T cell receptor associated transmembrane adaptor 1	1.4	N
CXCL2	2920	4q21	chemokine (C-X-C motif) ligand 2	1.4	N
IL16	3603	15q26	interleukin 16 (lymphocyte chemoattractant factor)	1.4	Y
IFITM2	10581	11p15	interferon induced transmembrane protein 2 (1-8D)	1.4	N
TLR10	81793	4p14	toll-like receptor 10	1.4	Y
DDX58	23586	9p12	DEAD (Asp-Glu-Ala-Asp) box polypeptide 58	1.4	Y
SPINK5	11005	5q32	serine peptidase inhibitor, Kazal type 5	1.4	Y
OAS3	4940	12q24	2'-5'-oligoadenylate synthetase 3, 100kDa	1.4	Y
OAS1	4938	12q24	2',5'-oligoadenylate synthetase 1, 40/46kDa	1.4	Y
IFI6	2537	1p35	interferon, alpha-inducible protein 6	1.4	N
TNFRSF11A	8792	18q22	tumor necrosis factor receptor superfamily, member 11a,	1.4	N
MBP	4155	18q23	myelin basic protein	1.4	Y

**Table 4. Male-biased immune genes with fold change  $\geq 1.4$** 

<b>Gene Symbol</b>	<b>Gene ID</b>	<b>Locus</b>	<b>Gene Name</b>	<b>Fold</b>	<b>EREF</b>
AIM2	9447	1q22	absent in melanoma 2	-1.4	N
FYN	2534	6q21	FYN oncogene related to SRC, FGR, YES	-1.4	Y
IRF8	3394	16q24	interferon regulatory factor 8	-1.4	N
SWAP70	23075	11p15	SWAP-70 protein	-1.4	N
IL17A	3605	6p12	interleukin 17A	-1.4	N
IL10	3586	1q31	interleukin 10	-1.5	N
IL5	3567	5q31	interleukin 5 (colony-stimulating factor, eosinophil)	-1.5	N
XCL1	6375	1q23	chemokine (C motif) ligand 1	-1.7	N
CXCL10	3627	4q21	chemokine (C-X-C motif) ligand 10	-1.7	N
CXCL9	4283	4q21	chemokine (C-X-C motif) ligand 9	-1.8	N
HLA-DQA1	3117	6p21	major histocompatibility complex, class II, DQ alpha 1	-2	N

**Table 5. Gene specific primer sequences**

<b>Primer</b>	<b>Sequence</b>
ACTB	f- GGA CTT CGA GCA AGA GAT GG
	r- AGC ACT GTG TTG GCG TAC AG
GZMA	f- ATTCTGGAAGCCCTTTGTTGTGCG
	r- AGAATATAGACACCAGGCCACGA
IFNG	f- TGAAGTGTGCGCCAGCAGCTAAA
	r- AGGCAGGACAACCATTACTGGGAT
LTB	f- ATTACCTCTACTGTCTCGTCGGCT
	r- TCCAGCACTGGAGTCACCGTCT
GNLY	f- AAACACAGGAGCTGGGCCGTGACTA
	r- GGTCGCAGCATTGGAAACACTTCT
IL12RB2	f- CTGTGAACGCTGAGCACACGATTT
	r- TGCTGTGTCGCCTTGAGCAAGATA
IL17A	f- AATCTCCACCGCAATGAGGA
	r- ACGTTCCCATCAGCGTTGA

Table S1

<b>Table S1. sexually dimorphic genes in unrestimulated T cells</b>			
<b>Gene Symbol</b>	<b>Identifier</b>	<b>Gene Name</b>	<b>Fold change Female vs Male</b>
XIST	7503	X (inactive)-specific transcript	10.2
GNLY	10578	granulysin	2.1
FADS2	9415	fatty acid desaturase 2	1.9
DDX58	23586	DEAD (Asp-Glu-Ala-Asp) box polypeptide 58	1.8
ANKRD15	23189	ankyrin repeat domain 15	1.8
ARTS-1	51752	type 1 tumor necrosis factor receptor shedding aminopeptidase regulator	1.8
IFNG	3458	interferon, gamma	1.8
ENTPD1	953	ectonucleoside triphosphate diphosphohydrolase 1	1.8
IL12RB2	3595	interleukin 12 receptor, beta 2	1.7
EPAS1	2034	endothelial PAS domain protein 1	1.7
EIF1AX	1964	eukaryotic translation initiation factor 1A, X-linked	1.7
TLK1	9874	tousled-like kinase 1	1.7
APOBEC3	9582	apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like 3B	1.7
CANX	821	calnexin	1.6
WDR1	9948	WD repeat domain 1	1.6
GZMB	3002	granzyme B (granzyme 2, cytotoxic T-lymphocyte-associated serine esterase 1)	1.6
PDE4A	5141	phosphodiesterase 4A, cAMP-specific (phosphodiesterase E2 dunce homolog, Drosophila)	1.6
TFAM	7019	transcription factor A, mitochondrial	1.6
ITM2A	9452	integral membrane protein 2A	1.6
SMC1L1	8243	SMC1 structural maintenance of chromosomes 1-like 1 (yeast)	1.6
ITGB1BP1	9270	integrin beta 1 binding protein 1	1.5
FADS1	3992	fatty acid desaturase 1	1.5
MX1	4599	myxovirus (influenza virus) resistance 1, interferon-inducible protein p78 (mouse)	1.5
BSG	682	basigin (Ok blood group)	1.5
SRI	6717	sorcin	1.5
HNRPH1	3187	heterogeneous nuclear ribonucleoprotein H1 (H)	1.5
FHL1	2273	four and a half LIM domains 1	1.5
OAS1	4938	2',5'-oligoadenylate synthetase 1, 40/46kDa	1.5
LST1	7940	leukocyte specific transcript 1	1.5
DDX3X	1654	DEAD (Asp-Glu-Ala-Asp) box polypeptide 3, X-linked	1.4
SFRS6	6431	splicing factor, arginine/serine-rich 6	1.4

Table S1

CTBP1	1487	C-terminal binding protein 1	1.4
IL2RA	3559	interleukin 2 receptor, alpha	1.4
PNPLA4	8228	patatin-like phospholipase domain containing 4	1.4
SEPT6	23157	septin 6	1.4
CCND2	894	cyclin D2	1.4
UTX	7403	ubiquitously transcribed tetratricopeptide repeat, X chromosome	1.4
ITGAM	3684	integrin, alpha M (complement component 3 receptor 3 subunit)	1.4
RANBP5	3843	RAN binding protein 5	1.4
WARS	7453	tryptophanyl-tRNA synthetase	1.4
CD74	972	CD74 molecule, major histocompatibility complex, class II invariant chain	1.4
SERPINE2	5270	serpin peptidase inhibitor, clade E (nexin, plasminogen activator inhibitor type 1), member 2	1.4
PRKX	5613	protein kinase, X-linked	1.4
BHLHB2	8553	basic helix-loop-helix domain containing, class B, 2	1.4
RRM2	6241	ribonucleotide reductase M2 polypeptide	1.4
SAMD9L	219285	sterile alpha motif domain containing 9-like	1.4
U2AF1L2	8233	U2 small nuclear RNA auxiliary factor 1-like 2	1.4
CSE1L	1434	CSE1 chromosome segregation 1-like (yeast)	1.4
STAT1	6772	signal transducer and activator of transcription 1, 91kDa	1.4
BIRC4BP	54739	XIAP associated factor-1	1.4
IFI6	2537	interferon, alpha-inducible protein 6	1.4
ARHGDI1A	396	Rho GDP dissociation inhibitor (GDI) alpha	1.4
CXCR4	7852	chemokine (C-X-C motif) receptor 4	1.4
PSAT1	29968	phosphoserine aminotransferase 1	1.4
EBP	10682	emopamil binding protein (sterol isomerase)	1.4
IARS	3376	isoleucine-tRNA synthetase	1.4
CXorf15	55787	chromosome X open reading frame 15	1.4
HSPA1B	3304	heat shock 70kDa protein 1B	1.3
CCR1	1230	chemokine (C-C motif) receptor 1	1.3
NUCKS1	64710	nuclear casein kinase and cyclin-dependent kinase substrate 1	1.3
CENPH	64946	centromere protein H	1.3
GFPT1	2673	glutamine-fructose-6-phosphate transaminase 1	1.3
SCLY	51540	selenocysteine lyase	1.3
IFI16	3428	interferon, gamma-inducible protein 16	1.3
PLSCR1	5359	phospholipid scramblase 1	1.3
PDIA6	10130	protein disulfide isomerase family A, member 6	1.3
EIF2S3	1968	eukaryotic translation initiation factor 2, subunit 3 gamma, 52kDa	1.3
HADHSC	3033	L-3-hydroxyacyl-Coenzyme A dehydrogenase, short chain	1.3



Table S1

ARMET	7873	arginine-rich, mutated in early stage tumors	1.3
CDK6	1021	cyclin-dependent kinase 6	1.3
G3BP2	9908	Ras-GTPase activating protein SH3 domain-binding protein 2	1.3
CD164	8763	CD164 molecule, sialomucin	1.3
SRR	63826	serine racemase	1.3
PTBP1	5725	polypyrimidine tract binding protein 1	1.3
RPN2	6185	ribophorin II	1.3
HSPA5	3309	heat shock 70kDa protein 5 (glucose-regulated protein, 78kDa)	1.3
SH2D1A	4068	SH2 domain protein 1A, Duncan's disease (lymphoproliferative syndrome)	1.2
SLC13A1	6561	solute carrier family 13 (sodium/sulfate symporters), member 1	-1.2
PURA	5813	purine-rich element binding protein A	-1.2
DNASE1	1773	deoxyribonuclease I	-1.2
PCDHGC3	5098	protocadherin gamma subfamily C, 3	-1.2
SSTR2	6752	somatostatin receptor 2	-1.2
DIP2A	23181	DIP2 disco-interacting protein 2 homolog A (Drosophila)	-1.2
RGS5	8490	regulator of G-protein signalling 5	-1.2
DTYMK	1841	deoxythymidylate kinase (thymidylate kinase)	-1.2
CILP	8483	cartilage intermediate layer protein, nucleotide pyrophosphohydrolase	-1.2
IL13RA1	3597	interleukin 13 receptor, alpha 1	-1.2
CYP8B1	1582	cytochrome P450, family 8, subfamily B, polypeptide 1	-1.2
IGFBP5	3488	insulin-like growth factor binding protein 5	-1.2
LPL	4023	lipoprotein lipase	-1.2
HEY1	23462	hairly/enhancer-of-split related with YRPW motif 1	-1.2
CAV2	858	caveolin 2	-1.2
SLC44A5	204962	solute carrier family 44, member 5	-1.2
CEP350	9857	centrosomal protein 350kDa	-1.2
PRSS1	5644	protease, serine, 1 (trypsin 1)	-1.2
RIMS1	22999	regulating synaptic membrane exocytosis 1	-1.2
MAB21L2	10586	mab-21-like 2 (C. elegans)	-1.2
ADRB1	153	adrenergic, beta-1-, receptor	-1.2
EDA	1896	ectodysplasin A	-1.2
PDGFC	56034	platelet derived growth factor C	-1.2
SMAD5	4090	SMAD, mothers against DPP homolog 5 (Drosophila)	-1.2
BIRC4	331	baculoviral IAP repeat-containing 4	-1.2
RAB27B	5874	RAB27B, member RAS oncogene family	-1.2
GKAP1	80318	G kinase anchoring protein 1	-1.2
KCNMA1	3778	potassium large conductance calcium-activated channel, subfamily M, alpha member 1	-1.2

Table S1

CCHCR1	54535	coiled-coil alpha-helical rod protein 1	-1.2
CNNM2	54805	cyclin M2	-1.2
NCOA3	8202	nuclear receptor coactivator 3	-1.2
SULT1C2	27233	sulfotransferase family, cytosolic, 1C, member 2	-1.2
ACRV1	56	acrosomal vesicle protein 1	-1.2
RGS20	8601	regulator of G-protein signalling 20	-1.2
STRBP	55342	spermatid perinuclear RNA binding protein	-1.2
SLC35E3	55508	solute carrier family 35, member E3	-1.2
VPS24	51652	vacuolar protein sorting 24 homolog ( <i>S. cerevisiae</i> )	-1.2
CLEC7A	64581	C-type lectin domain family 7, member A	-1.2
BRWD1	54014	bromodomain and WD repeat domain containing 1	-1.2
MX2	4600	myxovirus (influenza virus) resistance 2 (mouse)	-1.2
PDE10A	10846	phosphodiesterase 10A	-1.2
NARG1	80155	NMDA receptor regulated 1	-1.2
SOCS6	9306	suppressor of cytokine signaling 6	-1.2
OSBPL8	114882	oxysterol binding protein-like 8	-1.2
EBF3	253738	early B-cell factor 3	-1.2
MAGI1	9223	membrane associated guanylate kinase, WW and PDZ domain containing 1	-1.2
EML1	2009	echinoderm microtubule associated protein like 1	-1.2
PCBP2	5094	poly(rC) binding protein 2	-1.2
MOBP	4336	myelin-associated oligodendrocyte basic protein	-1.2
PCBD2	84105	pterin-4 alpha-carbinolamine dehydratase/dimerization cofactor of hepatocyte nuclear factor 1 alpha (T	-1.2
COCH	1690	coagulation factor C homolog, cochlin ( <i>Limulus polyphemus</i> )	-1.2
GABRA5	2558	gamma-aminobutyric acid (GABA) A receptor, alpha 5	-1.2
RBM5	10181	RNA binding motif protein 5	-1.2
TRIM10	10107	tripartite motif-containing 10	-1.2
SRRM2	23524	serine/arginine repetitive matrix 2	-1.2
RERE	473	arginine-glutamic acid dipeptide (RE) repeats	-1.2
CDH15	1013	cadherin 15, M-cadherin (myotubule)	-1.2
DDEF1	50807	development and differentiation enhancing factor 1	-1.2
IL17RB	55540	interleukin 17 receptor B	-1.2
KYNU	8942	kynureninase (L-kynurenine hydrolase)	-1.2
TNK2	10188	tyrosine kinase, non-receptor, 2	-1.2
LYST	1130	lysosomal trafficking regulator	-1.2
ZBP1	81030	Z-DNA binding protein 1	-1.2
DBT	1629	dihydrolipoamide branched chain transacylase E2	-1.2
CDC2L6	23097	cell division cycle 2-like 6 (CDK8-like)	-1.2

Table S1

MYOZ2	51778	myozenin 2	-1.2
MFAP5	8076	microfibrillar associated protein 5	-1.2
MYO5B	4645	myosin VB	-1.2
PTPN1	5770	protein tyrosine phosphatase, non-receptor type 1	-1.2
GATA4	2626	GATA binding protein 4	-1.2
IL6R	3570	interleukin 6 receptor	-1.2
PTGER3	5733	prostaglandin E receptor 3 (subtype EP3)	-1.2
GABRB3	2562	gamma-aminobutyric acid (GABA) A receptor, beta 3	-1.2
EHF	26298	ets homologous factor	-1.2
TTN	7273	titin	-1.2
REPS1	85021	RALBP1 associated Eps domain containing 1	-1.2
GFM1	85476	G elongation factor, mitochondrial 1	-1.2
FMN2	56776	formin 2	-1.3
ZNF281	23528	zinc finger protein 281	-1.3
NHS	4810	Nance-Horan syndrome (congenital cataracts and dental anomalies)	-1.3
HKR1	284459	GLI-Kruppel family member HKR1	-1.3
CR1	1378	complement component (3b/4b) receptor 1 (Knops blood group)	-1.3
CROP	51747	cisplatin resistance-associated overexpressed protein	-1.3
LAMA2	3908	laminin, alpha 2 (merosin, congenital muscular dystrophy)	-1.3
DPT	1805	dermatopontin	-1.3
GNG4	2786	guanine nucleotide binding protein (G protein), gamma 4	-1.3
HNT	50863	neurotrimin	-1.3
SUMF1	285362	sulfatase modifying factor 1	-1.3
MOG	4340	myelin oligodendrocyte glycoprotein	-1.3
CBFA2T3	863	core-binding factor, runt domain, alpha subunit 2; translocated to, 3	-1.3
CDH6	1004	cadherin 6, type 2, K-cadherin (fetal kidney)	-1.3
TCF8	6935	transcription factor 8 (represses interleukin 2 expression)	-1.3
BCAR3	8412	breast cancer anti-estrogen resistance 3	-1.3
BMPR2	659	bone morphogenetic protein receptor, type II (serine/threonine kinase)	-1.3
KCNE3	10008	potassium voltage-gated channel, Isk-related family, member 3	-1.3
AVIL	10677	advillin	-1.3
KLF12	11278	Kruppel-like factor 12	-1.3
RREB1	6239	ras responsive element binding protein 1	-1.3
SLC1A2	6506	solute carrier family 1 (glial high affinity glutamate transporter), member 2	-1.3
ASH1L	55870	ash1 (absent, small, or homeotic)-like (Drosophila)	-1.3
CARD11	84433	caspase recruitment domain family, member 11	-1.3
ICA1	3382	islet cell autoantigen 1, 69kDa	-1.3

Table S1

MXD4	10608	MAX dimerization protein 4	-1.3
TRIM31	11074	tripartite motif-containing 31	-1.3
VPS13B	157680	vacuolar protein sorting 13B (yeast)	-1.3
MTHFR	4524	5,10-methylenetetrahydrofolate reductase (NADPH)	-1.3
FALZ	2186	fetal Alzheimer antigen	-1.3
CD59	966	CD59 molecule, complement regulatory protein	-1.3
AKAP13	11214	A kinase (PRKA) anchor protein 13	-1.3
MAP4K4	9448	mitogen-activated protein kinase kinase kinase kinase 4	-1.3
MBP	4155	myelin basic protein	-1.3
C5orf5	51306	chromosome 5 open reading frame 5	-1.3
MYEF2	50804	myelin expression factor 2	-1.3
MS4A7	58475	membrane-spanning 4-domains, subfamily A, member 7	-1.3
MRC2	9902	mannose receptor, C type 2	-1.3
AKAP10	11216	A kinase (PRKA) anchor protein 10	-1.3
VTI1A	143187	vesicle transport through interaction with t-SNAREs homolog 1A (yeast)	-1.3
NR1D2	9975	nuclear receptor subfamily 1, group D, member 2	-1.3
KLHL24	54800	kelch-like 24 (Drosophila)	-1.3
C17orf81	23587	chromosome 17 open reading frame 81	-1.3
SON	6651	SON DNA binding protein	-1.3
CYB5A	1528	cytochrome b5 type A (microsomal)	-1.3
DYNC1H1	1778	dynein, cytoplasmic 1, heavy chain 1	-1.3
SAV1	60485	salvador homolog 1 (Drosophila)	-1.3
ZNF274	10782	zinc finger protein 274	-1.3
FNBP1	23048	formin binding protein 1	-1.3
ZNF587	84914	zinc finger protein 587	-1.3
L3MBTL	26013	l(3)mbt-like (Drosophila)	-1.3
ELL3	80237	elongation factor RNA polymerase II-like 3	-1.3
CPM	1368	carboxypeptidase M	-1.3
ZNF320	162967	zinc finger protein 320	-1.3
SUZ12	23512	suppressor of zeste 12 homolog (Drosophila)	-1.3
KLK7	5650	kallikrein 7 (chymotryptic, stratum corneum)	-1.3
CCDC65	85478	coiled-coil domain containing 65	-1.3
MAP2K5	5607	mitogen-activated protein kinase kinase 5	-1.3
PER3	8863	period homolog 3 (Drosophila)	-1.3
ATM	472	ataxia telangiectasia mutated (includes complementation groups A, C and D)	-1.3
ARHGEF1	9138	Rho guanine nucleotide exchange factor (GEF) 1	-1.3
FANK1	92565	fibronectin type III and ankyrin repeat domains 1	-1.3

Table S1

ANKRD11	29123	ankyrin repeat domain 11	-1.3
FXYD7	53822	FXYD domain containing ion transport regulator 7	-1.3
TTC12	54970	tetratricopeptide repeat domain 12	-1.3
SLC14A1	6563	solute carrier family 14 (urea transporter), member 1 (Kidd blood group)	-1.3
ZNF396	252884	zinc finger protein 396	-1.3
EML4	27436	echinoderm microtubule associated protein like 4	-1.3
CXXC5	51523	CXXC finger 5	-1.3
ATRX	546	alpha thalassemia/mental retardation syndrome X-linked (RAD54 homolog, <i>S. cerevisiae</i> )	-1.3
LRRN3	54674	leucine rich repeat neuronal 3	-1.3
TMEPAI	56937	transmembrane, prostate androgen induced RNA	-1.3
JMJD1C	221037	jumonji domain containing 1C	-1.3
MYH10	4628	myosin, heavy polypeptide 10, non-muscle	-1.3
ZFY	7544	zinc finger protein, Y-linked	-1.3
TRIB1	10221	tribbles homolog 1 ( <i>Drosophila</i> )	-1.3
CRTAM	56253	class-I MHC-restricted T cell associated molecule	-1.3
PRSS21	10942	protease, serine, 21 (testisin)	-1.3
ZNF606	80095	zinc finger protein 606	-1.3
PDE7B	27115	phosphodiesterase 7B	-1.3
LRMP	4033	lymphoid-restricted membrane protein	-1.3
ACCN2	41	amiloride-sensitive cation channel 2, neuronal	-1.3
RAB11FIP	9727	RAB11 family interacting protein 3 (class II)	-1.3
DHRS9	10170	dehydrogenase/reductase (SDR family) member 9	-1.3
PRKAB2	5565	protein kinase, AMP-activated, beta 2 non-catalytic subunit	-1.3
ARID2	196528	AT rich interactive domain 2 (ARID, RFX-like)	-1.3
ABLIM1	3983	actin binding LIM protein 1	-1.3
NOG	9241	noggin	-1.3
CD83	9308	CD83 molecule	-1.3
NALP1	22861	NACHT, leucine rich repeat and PYD (pyrin domain) containing 1	-1.3
GAS7	8522	growth arrest-specific 7	-1.3
NOX5	79400	NADPH oxidase, EF-hand calcium binding domain 5	-1.3
BRWD2	55717	bromodomain and WD repeat domain containing 2	-1.3
CHD9	80205	chromodomain helicase DNA binding protein 9	-1.3
REG4	83998	regenerating islet-derived family, member 4	-1.4
ADAM28	10863	ADAM metallopeptidase domain 28	-1.4
FGF9	2254	fibroblast growth factor 9 (glia-activating factor)	-1.4
APBA2	321	amyloid beta (A4) precursor protein-binding, family A, member 2 (X11-like)	-1.4
TLR5	7100	toll-like receptor 5	-1.4

Table S1

PTPRC	5788	protein tyrosine phosphatase, receptor type, C	-1.4
IFNAR2	3455	interferon (alpha, beta and omega) receptor 2	-1.4
TMEM80	283232	transmembrane protein 80	-1.4
PKIG	11142	protein kinase (cAMP-dependent, catalytic) inhibitor gamma	-1.4
MKL1	57591	megakaryoblastic leukemia (translocation) 1	-1.4
BCL11A	53335	B-cell CLL/lymphoma 11A (zinc finger protein)	-1.4
CEP110	11064	centrosomal protein 110kDa	-1.4
ZFP57	346171	zinc finger protein 57 homolog (mouse)	-1.4
SWAP70	23075	SWAP-70 protein	-1.4
DLL1	28514	delta-like 1 (Drosophila)	-1.4
MTUS1	57509	mitochondrial tumor suppressor 1	-1.4
WSB1	26118	WD repeat and SOCS box-containing 1	-1.4
ERMAP	114625	erythroblast membrane-associated protein (Scianna blood group)	-1.4
PNOC	5368	prepronociceptin	-1.4
ZNFN1A1	10320	zinc finger protein, subfamily 1A, 1 (Ikaros)	-1.4
RAB38	23682	RAB38, member RAS oncogene family	-1.4
CD8B	926	CD8b molecule	-1.4
OPTN	10133	optineurin	-1.4
FZD6	8323	frizzled homolog 6 (Drosophila)	-1.5
CD22	933	CD22 molecule	-1.5
ZBTB38	253461	zinc finger and BTB domain containing 38	-1.5
HLA-DOB	3112	major histocompatibility complex, class II, DO beta	-1.5
PLAGL1	5325	pleiomorphic adenoma gene-like 1	-1.5
DSC1	1823	desmocollin 1	-1.5
ZNF37A	7587	zinc finger protein 37A	-1.5
CD160	11126	CD160 molecule	-1.5
FBLN5	10516	fibulin 5	-1.5
KLRC3	3823	killer cell lectin-like receptor subfamily C, member 3	-1.5
LY86	9450	lymphocyte antigen 86	-1.5
SF1	7536	splicing factor 1	-1.5
FCGBP	8857	Fc fragment of IgG binding protein	-1.5
COL18A1	80781	collagen, type XVIII, alpha 1	-1.6
KSP37	83888	Ksp37 protein	-1.6
DDX43	55510	DEAD (Asp-Glu-Ala-Asp) box polypeptide 43	-1.6
IGH@	3492	immunoglobulin heavy locus	-1.6
C6orf160	387066	chromosome 6 open reading frame 160	-1.6
SCD5	79966	stearoyl-CoA desaturase 5	-1.7

Table S1

FTL	2512	ferritin, light polypeptide	-1.7
UTY	7404	ubiquitously transcribed tetratricopeptide repeat gene, Y-linked	-1.7
CHI3L2	1117	chitinase 3-like 2	-1.7
POU2AF1	5450	POU domain, class 2, associating factor 1	-1.7
MS4A1	931	membrane-spanning 4-domains, subfamily A, member 1	-1.7
DDX17	10521	DEAD (Asp-Glu-Ala-Asp) box polypeptide 17	-1.9
TCL1A	8115	T-cell leukemia/lymphoma 1A	-1.9
PRKY	5616	protein kinase, Y-linked	-2.1
HLA-DQB1	3119	major histocompatibility complex, class II, DQ beta 1	-2.1
HLA-DQA1	3117	major histocompatibility complex, class II, DQ alpha 1	-2.5
USP9Y	8287	ubiquitin specific peptidase 9, Y-linked (fat facets-like, Drosophila)	-3.0
DDX3Y	8653	DEAD (Asp-Glu-Ala-Asp) box polypeptide 3, Y-linked	-3.6
SMCY	8284	Smcy homolog, Y-linked (mouse)	-4.3
EIF1AY	9086	eukaryotic translation initiation factor 1A, Y-linked	-6.7
RPS4Y1	6192	ribosomal protein S4, Y-linked 1	-17.6

Table\_S2

Table S2 - Sexually dimorphic genes In restimulated T cells			
Gene Symbol	Identifier	Gene Name	Fold change Female/ Male
XIST	7503	X (inactive)-specific transcript	7.9
MX1	4599	myxovirus (influenza virus) resistance 1, interferon-inducible protein p78 (mouse)	1.9
FBXO6	26270	F-box protein 6	1.8
TIMP1	7076	TIMP metalloproteinase inhibitor 1	1.8
IFNG	3458	interferon, gamma	1.8
IL12RB2	3595	interleukin 12 receptor, beta 2	1.7
GNLY	10578	granulysin	1.7
PLAC8	51316	placenta-specific 8	1.7
HDHD1A	8226	haloacid dehalogenase-like hydrolase domain containing 1A	1.7
APOBEC3	9582	apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like 3B	1.7
PCDHB9	56127	protocadherin beta 9	1.7
GZMA	3001	granzyme A (granzyme 1, cytotoxic T-lymphocyte-associated serine esterase 3)	1.7
ANTXR2	118429	anthrax toxin receptor 2	1.7
GZMH	2999	granzyme H (cathepsin G-like 2, protein h-CCPX)	1.7
ENTPD1	953	ectonucleoside triphosphate diphosphohydrolase 1	1.7
DUSP8	1850	dual specificity phosphatase 8	1.7
PAK4	10298	p21(CDKN1A)-activated kinase 4	1.7
SSX3	10214	synovial sarcoma, X breakpoint 3	1.6
BIRC4BP	54739	XIAP associated factor-1	1.6
LYZ	4069	lysozyme (renal amyloidosis)	1.6
MKL1	57591	megakaryoblastic leukemia (translocation) 1	1.6
ACRV1	56	acrosomal vesicle protein 1	1.6
CDH3	1001	cadherin 3, type 1, P-cadherin (placental)	1.6
HBEGF	1839	heparin-binding EGF-like growth factor	1.6
CDH1	999	cadherin 1, type 1, E-cadherin (epithelial)	1.6
GZMK	3003	granzyme K (granzyme 3; tryptase II)	1.6
NAPSA	9476	napsin A aspartic peptidase	1.5
MIST	116449	mast cell immunoreceptor signal transducer	1.5
ZNF236	7776	zinc finger protein 236	1.5
IL1F5	26525	interleukin 1 family, member 5 (delta)	1.5
MASP1	5648	mannan-binding lectin serine peptidase 1 (C4/C2 activating component of Ra-reactive factor)	1.5
ARTS-1	51752	type 1 tumor necrosis factor receptor shedding aminopeptidase regulator	1.5



Table\_S2

IRF7	3665	interferon regulatory factor 7	1.5
RFX2	5990	regulatory factor X, 2 (influences HLA class II expression)	1.5
ELL3	80237	elongation factor RNA polymerase II-like 3	1.5
YBX2	51087	Y box binding protein 2	1.5
EPN1	29924	epsin 1	1.5
HTR4	3360	5-hydroxytryptamine (serotonin) receptor 4	1.5
WDR1	9948	WD repeat domain 1	1.5
ADAM29	11086	ADAM metallopeptidase domain 29	1.5
SAMD9L	219285	sterile alpha motif domain containing 9-like	1.5
SOD3	6649	superoxide dismutase 3, extracellular	1.5
EPS8L1	54869	EPS8-like 1	1.5
IFI44	10561	interferon-induced protein 44	1.5
NTRK3	4916	neurotrophic tyrosine kinase, receptor, type 3	1.5
CX3CL1	6376	chemokine (C-X3-C motif) ligand 1	1.5
MCF2L	23263	MCF.2 cell line derived transforming sequence-like	1.5
TFPI	7035	tissue factor pathway inhibitor (lipoprotein-associated coagulation inhibitor)	1.5
ZNF606	80095	zinc finger protein 606	1.5
ANKRD15	23189	ankyrin repeat domain 15	1.5
KIAA1715	80856	KIAA1715	1.5
P53AIP1	63970	p53-regulated apoptosis-inducing protein 1	1.5
RNASET2	8635	ribonuclease T2	1.5
SPHK2	56848	sphingosine kinase 2	1.5
ID3	3399	inhibitor of DNA binding 3, dominant negative helix-loop-helix protein	1.4
OAS3	4940	2'-5'-oligoadenylate synthetase 3, 100kDa	1.4
EPAS1	2034	endothelial PAS domain protein 1	1.4
H2AFY2	55506	H2A histone family, member Y2	1.4
NRAP	4892	nebulin-related anchoring protein	1.4
DAPK2	23604	death-associated protein kinase 2	1.4
HIF3A	64344	hypoxia inducible factor 3, alpha subunit	1.4
ADAM22	53616	ADAM metallopeptidase domain 22	1.4
PDGFD	80310	platelet derived growth factor D	1.4
TLR10	81793	toll-like receptor 10	1.4
TNFRSF11A	8792	tumor necrosis factor receptor superfamily, member 11a, NFkB activator	1.4
NCR2	9436	natural cytotoxicity triggering receptor 2	1.4
PCDHGC3	5098	protocadherin gamma subfamily C, 3	1.4
IL20RA	53832	interleukin 20 receptor, alpha	1.4
RASSF4	83937	Ras association (RalGDS/AF-6) domain family 4	1.4

Table\_S2

SEMA4F	10505	sema domain, immunoglobulin domain (Ig), transmembrane domain (TM) and short cytoplasmic domain, (sema)	1.4
ALDOB	229	aldolase B, fructose-bisphosphate	1.4
PER1	5187	period homolog 1 (Drosophila)	1.4
TCEB3B	51224	transcription elongation factor B polypeptide 3B (elongin A2)	1.4
BCL9L	283149	B-cell CLL/lymphoma 9-like	1.4
CPA5	93979	carboxypeptidase A5	1.4
SPOCK3	50859	sparc/osteonectin, cwcv and kazal-like domains proteoglycan (testican) 3	1.4
SYTL2	54843	synaptotagmin-like 2	1.4
LTB4DH	22949	leukotriene B4 12-hydroxydehydrogenase	1.4
SOX6	55553	SRY (sex determining region Y)-box 6	1.4
SPPL2B	56928	signal peptide peptidase-like 2B	1.4
AVIL	10677	advillin	1.4
ANGPTL3	27329	angiopoietin-like 3	1.4
EIF2AK2	5610	eukaryotic translation initiation factor 2-alpha kinase 2	1.4
ATN1	1822	atrophin 1	1.4
EIF1AX	1964	eukaryotic translation initiation factor 1A, X-linked	1.4
CXCL2	2920	chemokine (C-X-C motif) ligand 2	1.4
SLC6A15	55117	solute carrier family 6, member 15	1.4
DLEC1	9940	deleted in lung and esophageal cancer 1	1.4
LMO3	55885	LIM domain only 3 (rhombotin-like 2)	1.4
LSAMP	4045	limbic system-associated membrane protein	1.4
CCDC65	85478	coiled-coil domain containing 65	1.4
NPAS1	4861	neuronal PAS domain protein 1	1.4
OAS1	4938	2',5'-oligoadenylate synthetase 1, 40/46kDa	1.4
CTH	1491	cystathionase (cystathionine gamma-lyase)	1.4
ZFR	51663	zinc finger RNA binding protein	1.4
SFRS6	6431	splicing factor, arginine/serine-rich 6	1.4
THRAP3	9967	thyroid hormone receptor associated protein 3	1.4
PLXNA2	5362	plexin A2	1.4
FTCD	10841	formiminotransferase cyclodeaminase	1.4
CNP	1267	2',3'-cyclic nucleotide 3' phosphodiesterase	1.4
FGA	2243	fibrinogen alpha chain	1.4
RAPGEF5	9771	Rap guanine nucleotide exchange factor (GEF) 5	1.4
SEPT8	23176	septin 8	1.4
TLK1	9874	tousled-like kinase 1	1.4
MIPOL1	145282	mirror-image polydactyly 1	1.4
TRAT1	50852	T cell receptor associated transmembrane adaptor 1	1.4

Table\_S2

MS4A3	932	membrane-spanning 4-domains, subfamily A, member 3 (hematopoietic cell-specific)	1.4
IFITM2	10581	interferon induced transmembrane protein 2 (1-8D)	1.4
AIF1	199	allograft inflammatory factor 1	1.4
BMP8A	353500	bone morphogenetic protein 8a	1.4
SYDE1	85360	synapse defective 1, Rho GTPase, homolog 1 (C. elegans)	1.4
DDX3X	1654	DEAD (Asp-Glu-Ala-Asp) box polypeptide 3, X-linked	1.4
GAP43	2596	growth associated protein 43	1.4
TAF1L	138474	TAF1-like RNA polymerase II, TATA box binding protein (TBP)-associated factor, 210kDa	1.4
NRG2	9542	neuregulin 2	1.4
AGXT	189	alanine-glyoxylate aminotransferase (oxalosis I; hyperoxaluria I; glycolicaciduria; serine-pyruvate aminotransferase)	1.4
EGFR	1956	epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) oncogene homolog, avian)	1.4
FRZB	2487	frizzled-related protein	1.4
ANK1	286	ankyrin 1, erythrocytic	1.4
HNT	50863	neurotrimin	1.4
PTD004	29789	GTP-binding protein PTD004	1.4
PRIC285	85441	peroxisomal proliferator-activated receptor A interacting complex 285	1.4
GABBR2	9568	gamma-aminobutyric acid (GABA) B receptor, 2	1.4
PLXNC1	10154	plexin C1	1.4
SPINK5	11005	serine peptidase inhibitor, Kazal type 5	1.4
IFI6	2537	interferon, alpha-inducible protein 6	1.4
GOLPH4	27333	golgi phosphoprotein 4	1.4
HS3ST5	222537	heparan sulfate (glucosamine) 3-O-sulfotransferase 5	1.4
MME	4311	membrane metallo-endopeptidase (neutral endopeptidase, enkephalinase, CALLA, CD10)	1.4
PNPLA2	57104	patatin-like phospholipase domain containing 2	1.4
MACF1	23499	microtubule-actin crosslinking factor 1	1.4
ADARB2	105	adenosine deaminase, RNA-specific, B2 (RED2 homolog rat)	1.4
RIMS4	140730	regulating synaptic membrane exocytosis 4	1.4
FMN1	342184	formin 1	1.4
PRKX	5613	protein kinase, X-linked	1.4
CRSP2	9282	cofactor required for Sp1 transcriptional activation, subunit 2, 150kDa	1.4
DDX58	23586	DEAD (Asp-Glu-Ala-Asp) box polypeptide 58	1.4
RAI1	10743	retinoic acid induced 1	1.4
TOPORS	10210	topoisomerase I binding, arginine/serine-rich	1.4
TAF1C	9013	TATA box binding protein (TBP)-associated factor, RNA polymerase I, C, 110kDa	1.4
MYOZ3	91977	myozenin 3	1.4
WWTR1	25937	WW domain containing transcription regulator 1	1.4
NPAS2	4862	neuronal PAS domain protein 2	1.4

Table\_S2

RET	5979	ret proto-oncogene (multiple endocrine neoplasia and medullary thyroid carcinoma 1, Hirschsprung disease)	1.4
DPF3	8110	D4, zinc and double PHD fingers, family 3	1.4
HEY1	23462	hairy/enhancer-of-split related with YRPW motif 1	1.4
KCNN1	3780	potassium intermediate/small conductance calcium-activated channel, subfamily N, member 1	1.4
KRT17	3872	keratin 17	1.4
NFKBIB	4793	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, beta	1.4
TRPC4	7223	transient receptor potential cation channel, subfamily C, member 4	1.4
WHSC1	7468	Wolf-Hirschhorn syndrome candidate 1	1.4
DIAPH1	1729	diaphanous homolog 1 (Drosophila)	1.4
OPRL1	4987	opiate receptor-like 1	1.4
STK11	6794	serine/threonine kinase 11	1.4
LDLRAP1	26119	low density lipoprotein receptor adaptor protein 1	1.4
CYP39A1	51302	cytochrome P450, family 39, subfamily A, polypeptide 1	1.4
FGFR2	2263	fibroblast growth factor receptor 2 (bacteria-expressed kinase, keratinocyte growth factor receptor, craniofacial d	1.4
LTB	4050	lymphotoxin beta (TNF superfamily, member 3)	1.4
MYO1G	64005	myosin IG	1.4
BRE	9577	brain and reproductive organ-expressed (TNFRSF1A modulator)	1.4
VIPR2	7434	vasoactive intestinal peptide receptor 2	1.4
STMN4	81551	stathmin-like 4	1.4
ABCA1	19	ATP-binding cassette, sub-family A (ABC1), member 1	1.4
ZNF96	9753	zinc finger protein 96	1.4
TMC8	147138	transmembrane channel-like 8	1.4
IL16	3603	interleukin 16 (lymphocyte chemoattractant factor)	1.4
LRP6	4040	low density lipoprotein receptor-related protein 6	1.4
MYLIP	29116	myosin regulatory light chain interacting protein	1.4
RGS12	6002	regulator of G-protein signalling 12	1.4
PDE4A	5141	phosphodiesterase 4A, cAMP-specific (phosphodiesterase E2 dunce homolog, Drosophila)	1.4
CHST5	23563	carbohydrate (N-acetylglucosamine 6-O) sulfotransferase 5	1.4
GRID1	2894	glutamate receptor, ionotropic, delta 1	1.4
DGKB	1607	diacylglycerol kinase, beta 90kDa	1.4
RAB6B	51560	RAB6B, member RAS oncogene family	1.4
MBP	4155	myelin basic protein	1.4
NYX	60506	nyctalopin	1.4
HMGCS1	3157	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 1 (soluble)	1.3
PNPLA4	8228	patatin-like phospholipase domain containing 4	1.3
BHLHB2	8553	basic helix-loop-helix domain containing, class B, 2	1.3
GLP1R	2740	glucagon-like peptide 1 receptor	1.3

Table\_S2

HSPA1B	3304	heat shock 70kDa protein 1B	1.3
FXYD3	5349	FXYD domain containing ion transport regulator 3	1.3
CA12	771	carbonic anhydrase XII	1.3
CSTA	1475	cystatin A (stefin A)	1.3
MYO5B	4645	myosin VB	1.3
PRDM11	56981	PR domain containing 11	1.3
SMYD3	64754	SET and MYND domain containing 3	1.3
PEX16	9409	peroxisomal biogenesis factor 16	1.3
MAN1A2	10905	mannosidase, alpha, class 1A, member 2	1.3
GATA1	2623	GATA binding protein 1 (globin transcription factor 1)	1.3
PML	5371	promyelocytic leukemia	1.3
TLE4	7091	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	1.3
TEAD2	8463	TEA domain family member 2	1.3
FBLN1	2192	fibulin 1	1.3
HSPB7	27129	heat shock 27kDa protein family, member 7 (cardiovascular)	1.3
SEPT6	23157	septin 6	1.3
MUC1	4582	mucin 1, cell surface associated	1.3
TRIM36	55521	tripartite motif-containing 36	1.3
RAB40C	57799	RAB40C, member RAS oncogene family	1.3
ST3GAL3	6487	ST3 beta-galactoside alpha-2,3-sialyltransferase 3	1.3
ANGPT1	284	angiopoietin 1	1.3
ITGB4	3691	integrin, beta 4	1.3
MTSS1	9788	metastasis suppressor 1	1.3
USF2	7392	upstream transcription factor 2, c-fos interacting	1.3
PDE5A	8654	phosphodiesterase 5A, cGMP-specific	1.3
LST1	7940	leukocyte specific transcript 1	1.3
ITSN1	6453	intersectin 1 (SH3 domain protein)	1.3
SLC7A4	6545	solute carrier family 7 (cationic amino acid transporter, y+ system), member 4	1.3
KLK4	9622	kallikrein 4 (prostase, enamel matrix, prostate)	1.3
TCL6	27004	T-cell leukemia/lymphoma 6	1.3
SPN	6693	sialophorin (leukosialin, CD43)	1.3
IBRDC2	255488	IBR domain containing 2	1.3
KLHL20	27252	kelch-like 20 (Drosophila)	1.3
CASQ2	845	calsequestrin 2 (cardiac muscle)	1.3
LGP2	79132	likely ortholog of mouse D11lgp2	1.3
LZTS2	84445	leucine zipper, putative tumor suppressor 2	1.3
ACVR1B	91	activin A receptor, type IB	1.3

Table\_S2

CHN2	1124	chimerin (chimaerin) 2	1.3
CCR1	1230	chemokine (C-C motif) receptor 1	1.3
E2F2	1870	E2F transcription factor 2	1.3
MAN2B1	4125	mannosidase, alpha, class 2B, member 1	1.3
BCL3	602	B-cell CLL/lymphoma 3	1.3
KIAA1109	84162	KIAA1109	1.3
STAM2	10254	signal transducing adaptor molecule (SH3 domain and ITAM motif) 2	1.3
SLC2A12	154091	solute carrier family 2 (facilitated glucose transporter), member 12	1.3
FBLIM1	54751	filamin binding LIM protein 1	1.3
HIVEP3	59269	human immunodeficiency virus type I enhancer binding protein 3	1.3
AP1S1	1174	adaptor-related protein complex 1, sigma 1 subunit	1.3
HLXB9	3110	homeobox HB9	1.3
LUC7L	55692	LUC7-like ( <i>S. cerevisiae</i> )	1.3
NEUROD6	63974	neurogenic differentiation 6	1.3
CAMK2B	816	calcium/calmodulin-dependent protein kinase (CaM kinase) II beta	1.3
THRAP5	10025	thyroid hormone receptor associated protein 5	1.3
SLC22A7	10864	solute carrier family 22 (organic anion transporter), member 7	1.3
IL31RA	133396	interleukin 31 receptor A	1.3
GLIS1	148979	GLIS family zinc finger 1	1.3
AGER	177	advanced glycosylation end product-specific receptor	1.3
POLK	51426	polymerase (DNA directed) kappa	1.3
TUB	7275	tubby homolog (mouse)	1.3
KLF8	11279	Kruppel-like factor 8	1.3
TXNDC11	51061	thioredoxin domain containing 11	1.3
RAB20	55647	RAB20, member RAS oncogene family	1.3
CROCC	9696	ciliary rootlet coiled-coil, rootletin	1.3
HNRPH1	3187	heterogeneous nuclear ribonucleoprotein H1 (H)	1.3
VWF	7450	von Willebrand factor	1.3
C15orf48	84419	chromosome 15 open reading frame 48	1.3
RASD1	51655	RAS, dexamethasone-induced 1	1.3
PRKG2	5593	protein kinase, cGMP-dependent, type II	1.3
COL3A1	1281	collagen, type III, alpha 1 (Ehlers-Danlos syndrome type IV, autosomal dominant)	1.3
GLRA2	2742	glycine receptor, alpha 2	1.3
SMOX	54498	spermine oxidase	1.3
HAVCR2	84868	hepatitis A virus cellular receptor 2	1.3
DPT	1805	dermatopontin	1.3
TRERF1	55809	transcriptional regulating factor 1	1.3

Table\_S2

SLC1A2	6506	solute carrier family 1 (glial high affinity glutamate transporter), member 2	1.3
H6PD	9563	hexose-6-phosphate dehydrogenase (glucose 1-dehydrogenase)	1.3
LGALS1	3956	lectin, galactoside-binding, soluble, 1 (galectin 1)	1.3
FADS3	3995	fatty acid desaturase 3	1.3
GIMAP4	55303	GTPase, IMAP family member 4	1.3
TPD52L1	7164	tumor protein D52-like 1	1.3
OSCAR	126014	osteoclast-associated receptor	1.3
HNRPL	3191	heterogeneous nuclear ribonucleoprotein L	1.3
MUC13	56667	mucin 13, cell surface associated	1.3
CXCR4	7852	chemokine (C-X-C motif) receptor 4	1.3
SNCAIP	9627	synuclein, alpha interacting protein (synphilin)	1.3
SPOCK2	9806	sparc/osteonectin, cwcv and kazal-like domains proteoglycan (testican) 2	1.3
EHD1	10938	EH-domain containing 1	1.3
EDA	1896	ectodysplasin A	1.3
PAK7	57144	p21(CDKN1A)-activated kinase 7	1.3
VAV2	7410	vav 2 oncogene	1.3
BCL10	8915	B-cell CLL/lymphoma 10	1.3
DSCAM	1826	Down syndrome cell adhesion molecule	1.3
EVC	2121	Ellis van Creveld syndrome	1.3
HTR3A	3359	5-hydroxytryptamine (serotonin) receptor 3A	1.3
RGNEF	64283	Rho-guanine nucleotide exchange factor	1.3
SMCX	8242	Smcy homolog, X-linked (mouse)	1.3
NR6A1	2649	nuclear receptor subfamily 6, group A, member 1	1.3
ISL1	3670	ISL1 transcription factor, LIM/homeodomain, (islet-1)	1.3
NOS1	4842	nitric oxide synthase 1 (neuronal)	1.3
APOM	55937	apolipoprotein M	1.3
TP73	7161	tumor protein p73	1.3
SHKBP1	92799	SH3KBP1 binding protein 1	1.3
SEPT9	10801	septin 9	1.3
ADRB1	153	adrenergic, beta-1-, receptor	1.3
EVX1	2128	eve, even-skipped homeobox homolog 1 (Drosophila)	1.3
IFIT2	3433	interferon-induced protein with tetratricopeptide repeats 2	1.3
KIFC1	3833	kinesin family member C1	1.3
MAP6	4135	microtubule-associated protein 6	1.3
RHAG	6005	Rh-associated glycoprotein	1.3
MAGI1	9223	membrane associated guanylate kinase, WW and PDZ domain containing 1	1.3
FUT2	2524	fucosyltransferase 2 (secretor status included)	1.3

Table\_S2

JRK	8629	jerky homolog (mouse)	1.3
POFUT2	23275	protein O-fucosyltransferase 2	1.3
PRKCE	5581	protein kinase C, epsilon	1.3
ANKH	56172	ankylosis, progressive homolog (mouse)	1.3
VASP	7408	vasodilator-stimulated phosphoprotein	1.3
IGFBP3	3486	insulin-like growth factor binding protein 3	1.3
MYBPC3	4607	myosin binding protein C, cardiac	1.3
PLSCR3	57048	phospholipid scramblase 3	1.3
TNFAIP2	7127	tumor necrosis factor, alpha-induced protein 2	1.3
TNFRSF18	8784	tumor necrosis factor receptor superfamily, member 18	1.3
RGS6	9628	regulator of G-protein signalling 6	1.3
FHL1	2273	four and a half LIM domains 1	1.3
KBTBD2	25948	kelch repeat and BTB (POZ) domain containing 2	1.3
GP2	2813	glycoprotein 2 (zymogen granule membrane)	1.3
SMARCD1	6602	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily d, member 1	1.3
CDKN2C	1031	cyclin-dependent kinase inhibitor 2C (p18, inhibits CDK4)	1.3
SORBS1	10580	sorbin and SH3 domain containing 1	1.3
CETP	1071	cholesteryl ester transfer protein, plasma	1.3
CSPG2	1462	chondroitin sulfate proteoglycan 2 (versican)	1.3
MMP28	79148	matrix metalloproteinase 28	1.3
PIP5K2B	8396	phosphatidylinositol-4-phosphate 5-kinase, type II, beta	1.3
FADS1	3992	fatty acid desaturase 1	1.3
ANGPT2	285	angiopoietin 2	1.3
CABP4	57010	calcium binding protein 4	1.3
MS4A6A	64231	membrane-spanning 4-domains, subfamily A, member 6A	1.3
TRIM55	84675	tripartite motif-containing 55	1.3
CSTF2T	23283	cleavage stimulation factor, 3' pre-RNA, subunit 2, 64kDa, tau variant	1.3
BACE1	23621	beta-site APP-cleaving enzyme 1	1.3
PDE6G	5148	phosphodiesterase 6G, cGMP-specific, rod, gamma	1.3
PLN	5350	phospholamban	1.3
PARVA	55742	parvin, alpha	1.3
PSCA	8000	prostate stem cell antigen	1.3
NIPSNAP1	8508	nipsnap homolog 1 (C. elegans)	1.3
ZFP28	140612	zinc finger protein 28 homolog (mouse)	1.3
GFRA2	2675	GDNF family receptor alpha 2	1.3
MPL	4352	myeloproliferative leukemia virus oncogene	1.3
PAPPA	5069	pregnancy-associated plasma protein A, pappalysin 1	1.3



Table\_S2

SHOX2	6474	short stature homeobox 2	1.3
UNC5C	8633	unc-5 homolog C (C. elegans)	1.3
KLC3	147700	kinesin light chain 3	1.3
CD209	30835	CD209 molecule	1.3
PKP1	5317	plakophilin 1 (ectodermal dysplasia/skin fragility syndrome)	1.3
FKBP8	23770	FK506 binding protein 8, 38kDa	1.3
ALK	238	anaplastic lymphoma kinase (Ki-1)	1.3
NCR3	259197	natural cytotoxicity triggering receptor 3	1.3
GAPDHS	26330	glyceraldehyde-3-phosphate dehydrogenase, spermatogenic	1.3
NRBP2	340371	nuclear receptor binding protein 2	1.3
KRT6A	3853	keratin 6A	1.3
OATL1	4943	ornithine aminotransferase-like 1	1.3
PMP2	5375	peripheral myelin protein 2	1.3
MADCAM1	8174	mucosal vascular addressin cell adhesion molecule 1	1.3
TMTC1	83857	transmembrane and tetratricopeptide repeat containing 1	1.3
USH1C	10083	Usher syndrome 1C (autosomal recessive, severe)	1.3
CHI3L1	1116	chitinase 3-like 1 (cartilage glycoprotein-39)	1.3
SIGLEC11	114132	sialic acid binding Ig-like lectin 11	1.3
RHOJ	57381	ras homolog gene family, member J	1.3
NRP2	8828	neuropilin 2	1.3
EVA1	10205	epithelial V-like antigen 1	1.3
HOXA9	3205	homeobox A9	1.3
MSR1	4481	macrophage scavenger receptor 1	1.3
CXorf15	55787	chromosome X open reading frame 15	1.3
ACSS2	55902	acyl-CoA synthetase short-chain family member 2	1.3
TNFSF10	8743	tumor necrosis factor (ligand) superfamily, member 10	1.3
MIA2	117153	melanoma inhibitory activity 2	1.3
KCTD13	253980	potassium channel tetramerisation domain containing 13	1.3
LRP2	4036	low density lipoprotein-related protein 2	1.3
CACNB4	785	calcium channel, voltage-dependent, beta 4 subunit	1.3
APOA1	335	apolipoprotein A-I	1.3
GLDN	342035	gliomedin	1.3
KCNS2	3788	potassium voltage-gated channel, delayed-rectifier, subfamily S, member 2	1.3
SLC17A7	57030	solute carrier family 17 (sodium-dependent inorganic phosphate cotransporter), member 7	1.3
TRAPPC2	6399	trafficking protein particle complex 2	1.3
SYN1	6853	synapsin I	1.3
AKAP5	9495	A kinase (PRKA) anchor protein 5	1.3

Table\_S2

DIO2	1734	deiodinase, iodothyronine, type II	1.3
TFAP2B	7021	transcription factor AP-2 beta (activating enhancer binding protein 2 beta)	1.3
TNS1	7145	tensin 1	1.3
SSPN	8082	sarcospan (Kras oncogene-associated gene)	1.3
SWS1	125150	SWIM-domain containing Srs2 interacting protein 1	1.3
MS4A2	2206	membrane-spanning 4-domains, subfamily A, member 2 (Fc fragment of IgE, high affinity I, receptor for; beta po	1.3
ALDH3A2	224	aldehyde dehydrogenase 3 family, member A2	1.3
KCNC3	3748	potassium voltage-gated channel, Shaw-related subfamily, member 3	1.3
SCN3B	55800	sodium channel, voltage-gated, type III, beta	1.3
NMUR2	56923	neuromedin U receptor 2	1.3
SPTBN1	6711	spectrin, beta, non-erythrocytic 1	1.3
PCDHA9	9752	protocadherin alpha 9	1.3
GFRA4	64096	GDNF family receptor alpha 4	1.3
APOC2	344	apolipoprotein C-II	1.3
SERPINB9	5272	serpin peptidase inhibitor, clade B (ovalbumin), member 9	1.3
PLD1	5337	phospholipase D1, phosphatidylcholine-specific	1.3
CYP3A43	64816	cytochrome P450, family 3, subfamily A, polypeptide 43	1.3
NAV1	89796	neuron navigator 1	1.3
INADL	10207	InaD-like (Drosophila)	1.3
TNFSF13B	10673	tumor necrosis factor (ligand) superfamily, member 13b	1.3
INPP5D	3635	inositol polyphosphate-5-phosphatase, 145kDa	1.3
THBS1	7057	thrombospondin 1	1.3
TPM1	7168	tropomyosin 1 (alpha)	1.3
ANGPTL2	23452	angiopoietin-like 2	1.3
ACOT11	26027	acyl-CoA thioesterase 11	1.3
BHLHB5	27319	basic helix-loop-helix domain containing, class B, 5	1.3
IFNA2	3440	interferon, alpha 2	1.3
TCF7	6932	transcription factor 7 (T-cell specific, HMG-box)	1.3
CCR5	1234	chemokine (C-C motif) receptor 5	1.3
GPR37	2861	G protein-coupled receptor 37 (endothelin receptor type B-like)	1.3
CREBL1	1388	cAMP responsive element binding protein-like 1	1.3
PAX8	7849	paired box gene 8	1.3
MOBP	4336	myelin-associated oligodendrocyte basic protein	1.3
UPB1	51733	ureidopropionase, beta	1.3
PLAU	5328	plasminogen activator, urokinase	1.3
SLC8A2	6543	solute carrier family 8 (sodium-calcium exchanger), member 2	1.3
TECTA	7007	tectorin alpha	1.3

Table\_S2

PAPSS2	9060	3'-phosphoadenosine 5'-phosphosulfate synthase 2	1.3
ITGA2B	3674	integrin, alpha 2b (platelet glycoprotein IIb of IIb/IIIa complex, antigen CD41)	1.3
KIRREL	55243	kin of IRRE like (Drosophila)	1.3
NLGN2	57555	neuroligin 2	1.3
BSG	682	basigin (Ok blood group)	1.3
SCRG1	11341	scrapie responsive protein 1	1.3
DAB2	1601	disabled homolog 2, mitogen-responsive phosphoprotein (Drosophila)	1.3
GUCA1A	2978	guanylate cyclase activator 1A (retina)	1.3
PLSCR1	5359	phospholipid scramblase 1	1.3
ZNF398	57541	zinc finger protein 398	1.3
SLC1A7	6512	solute carrier family 1 (glutamate transporter), member 7	1.3
THY1	7070	Thy-1 cell surface antigen	1.3
SYNPO	11346	synaptopodin	1.3
AQP6	363	aquaporin 6, kidney specific	1.3
ABO	28	ABO blood group (transferase A, alpha 1-3-N-acetylgalactosaminyltransferase; transferase B, alpha 1-3-galactos	1.3
HBE1	3046	hemoglobin, epsilon 1	1.3
KCNH2	3757	potassium voltage-gated channel, subfamily H (eag-related), member 2	1.3
PLEKHC1	10979	pleckstrin homology domain containing, family C (with FERM domain) member 1	1.3
GP1BB	2812	glycoprotein Ib (platelet), beta polypeptide	1.3
MLLT4	4301	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 4	1.3
AXL	558	AXL receptor tyrosine kinase	1.3
ABCD4	5826	ATP-binding cassette, sub-family D (ALD), member 4	1.3
GOLGA2	2801	golgi autoantigen, golgin subfamily a, 2	1.3
PTGIR	5739	prostaglandin I2 (prostacyclin) receptor (IP)	1.3
TBX1	6899	T-box 1	1.3
CANT1	124583	calcium activated nucleotidase 1	1.3
AFF2	2334	AF4/FMR2 family, member 2	1.3
TRIM29	23650	tripartite motif-containing 29	1.3
SFTPB	6439	surfactant, pulmonary-associated protein B	1.3
PRDM2	7799	PR domain containing 2, with ZNF domain	1.3
CASP10	843	caspase 10, apoptosis-related cysteine peptidase	1.3
IFIT1	3434	interferon-induced protein with tetratricopeptide repeats 1	1.3
ANGPTL4	51129	angiopoietin-like 4	1.3
TKTL1	8277	transketolase-like 1	1.3
EHF	26298	ets homologous factor	1.3
MYH11	4629	myosin, heavy polypeptide 11, smooth muscle	1.3
CEACAM1	634	carcinoembryonic antigen-related cell adhesion molecule 1 (biliary glycoprotein)	1.3

Table\_S2

KLF12	11278	Kruppel-like factor 12	1.3
CCDC80	151887	coiled-coil domain containing 80	1.3
GPX3	2878	glutathione peroxidase 3 (plasma)	1.3
EHD2	30846	EH-domain containing 2	1.3
ATP1A2	477	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 2 (+) polypeptide	1.3
MYOZ2	51778	myozenin 2	1.3
DOK4	55715	docking protein 4	1.3
SMTN	6525	smoothelin	1.3
RAB6IP2	23085	RAB6 interacting protein 2	1.3
ICOSLG	23308	inducible T-cell co-stimulator ligand	1.3
GAS2	2620	growth arrest-specific 2	1.3
LFNG	3955	lunatic fringe homolog (Drosophila)	1.3
ARSB	411	arylsulfatase B	1.3
PRMT7	54496	protein arginine methyltransferase 7	1.3
KREMEN1	83999	kringle containing transmembrane protein 1	1.3
MAP7	9053	microtubule-associated protein 7	1.3
ELF3	1999	E74-like factor 3 (ets domain transcription factor, epithelial-specific )	1.3
FOXO1A	2308	forkhead box O1A (rhabdomyosarcoma)	1.3
SOX11	6664	SRY (sex determining region Y)-box 11	1.3
SIM2	6493	single-minded homolog 2 (Drosophila)	1.3
CALD1	800	caldesmon 1	1.3
TP73L	8626	tumor protein p73-like	1.3
PEX5L	51555	peroxisomal biogenesis factor 5-like	1.3
PTPRF	5792	protein tyrosine phosphatase, receptor type, F	1.3
GABRB2	2561	gamma-aminobutyric acid (GABA) A receptor, beta 2	1.3
SMURF1	57154	SMAD specific E3 ubiquitin protein ligase 1	1.3
SEMA4G	57715	sema domain, immunoglobulin domain (Ig), transmembrane domain (TM) and short cytoplasmic domain, (sema	1.3
SOX10	6663	SRY (sex determining region Y)-box 10	1.3
TSGA10	80705	testis specific, 10	1.3
TNS4	84951	tensin 4	1.3
LRRC17	10234	leucine rich repeat containing 17	1.3
U2AF1L2	8233	U2 small nuclear RNA auxiliary factor 1-like 2	1.3
FCRL1	115350	Fc receptor-like 1	1.3
IL11	3589	interleukin 11	1.3
CHST12	55501	carbohydrate (chondroitin 4) sulfotransferase 12	1.3
SFRP1	6422	secreted frizzled-related protein 1	1.3
SYT7	9066	synaptotagmin VII	1.3

Table\_S2

DLGAP1	9229	discs, large (Drosophila) homolog-associated protein 1	1.3
OPTC	26254	opticin	1.3
MCHR1	2847	melanin-concentrating hormone receptor 1	1.3
STXBP1	6812	syntaxin binding protein 1	1.3
TNFSF4	7292	tumor necrosis factor (ligand) superfamily, member 4 (tax-transcriptionally activated glycoprotein 1, 34kDa)	1.3
NETO1	81832	neuropilin (NRP) and tolloid (TLL)-like 1	1.3
RSAD2	91543	radical S-adenosyl methionine domain containing 2	1.3
HDAC5	10014	histone deacetylase 5	1.3
DMWD	1762	dystrophia myotonica-containing WD repeat motif	1.3
ISG20	3669	interferon stimulated exonuclease gene 20kDa	1.3
VGLL1	51442	vestigial like 1 (Drosophila)	1.3
TPD52	7163	tumor protein D52	1.3
FBN1	2200	fibrillin 1	1.3
BCAS3	54828	breast carcinoma amplified sequence 3	1.3
GCC1	79571	GRIP and coiled-coil domain containing 1	1.3
RNF39	80352	ring finger protein 39	1.3
GPD1	2819	glycerol-3-phosphate dehydrogenase 1 (soluble)	1.3
GPR6	2830	G protein-coupled receptor 6	1.3
F11R	50848	F11 receptor	1.3
SLC45A2	51151	solute carrier family 45, member 2	1.3
SEC14L1	6397	SEC14-like 1 (S. cerevisiae)	1.3
UTX	7403	ubiquitously transcribed tetratricopeptide repeat, X chromosome	1.3
DNAH11	8701	dynein, axonemal, heavy polypeptide 11	1.3
PRG4	10216	proteoglycan 4	1.3
POSTN	10631	periostin, osteoblast specific factor	1.3
CHRNA5	1138	cholinergic receptor, nicotinic, alpha 5	1.3
DIP2A	23181	DIP2 disco-interacting protein 2 homolog A (Drosophila)	1.3
PDE1C	5137	phosphodiesterase 1C, calmodulin-dependent 70kDa	1.3
PB1	55193	polybromo 1	1.3
SLPI	6590	secretory leukocyte peptidase inhibitor	1.3
TK2	7084	thymidine kinase 2, mitochondrial	1.3
WT1	7490	Wilms tumor 1	1.3
FABP3	2170	fatty acid binding protein 3, muscle and heart (mammary-derived growth inhibitor)	1.3
SNAI1	6615	snail homolog 1 (Drosophila)	1.3
CST8	10047	cystatin 8 (cystatin-related epididymal specific)	1.3
MAP3K2	10746	mitogen-activated protein kinase kinase kinase 2	1.3
CSF3R	1441	colony stimulating factor 3 receptor (granulocyte)	1.3

Table\_S2

AMOTL1	154810	angiomin like 1	1.3
JAG1	182	jagged 1 (Alagille syndrome)	1.3
GNAO1	2775	guanine nucleotide binding protein (G protein), alpha activating activity polypeptide O	1.3
ANGPT4	51378	angiopoietin 4	1.3
PRLR	5618	prolactin receptor	1.3
PREX1	57580	phosphatidylinositol 3,4,5-trisphosphate-dependent RAC exchanger 1	1.3
TSSK6	83983	testis-specific serine kinase 6	1.3
CHD6	84181	chromodomain helicase DNA binding protein 6	1.3
CD1B	910	CD1b molecule	1.3
CHST3	9469	carbohydrate (chondroitin 6) sulfotransferase 3	1.3
HOXA3	3200	homeobox A3	1.3
MBD1	4152	methyl-CpG binding domain protein 1	1.3
SOX3	6658	SRY (sex determining region Y)-box 3	1.3
TRPM3	80036	transient receptor potential cation channel, subfamily M, member 3	1.3
HOXB13	10481	homeobox B13	1.3
SYNPO2	171024	synaptopodin 2	1.3
SOSTDC1	25928	sclerostin domain containing 1	1.3
OR2H1	26716	olfactory receptor, family 2, subfamily H, member 1	1.3
GPR132	29933	G protein-coupled receptor 132	1.3
MMP14	4323	matrix metalloproteinase 14 (membrane-inserted)	1.3
PRODH2	58510	proline dehydrogenase (oxidase) 2	1.3
WIZ	58525	widely-interspaced zinc finger motifs	1.3
RNASE1	6035	ribonuclease, RNase A family, 1 (pancreatic)	1.3
JAM3	83700	junctional adhesion molecule 3	1.3
AKR1C3	8644	aldo-keto reductase family 1, member C3 (3-alpha hydroxysteroid dehydrogenase, type II)	1.3
DBH	1621	dopamine beta-hydroxylase (dopamine beta-monoxygenase)	1.3
GSN	2934	gelsolin (amyloidosis, Finnish type)	1.3
TLE2	7089	transducin-like enhancer of split 2 (E(sp1) homolog, Drosophila)	1.3
CLDN6	9074	claudin 6	1.3
DCN	1634	decorin	1.3
BIN1	274	bridging integrator 1	1.3
HUNK	30811	hormonally upregulated Neu-associated kinase	1.3
ASCL1	429	achaete-scute complex-like 1 (Drosophila)	1.3
SHC3	53358	SHC (Src homology 2 domain containing) transforming protein 3	1.3
ZFX	7543	zinc finger protein, X-linked	1.3
MDGA1	266727	MAM domain containing glycosylphosphatidylinositol anchor 1	1.3
PFKFB1	5207	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 1	1.3

Table\_S2

GRM8	2918	glutamate receptor, metabotropic 8	1.3
PINK1	65018	PTEN induced putative kinase 1	1.3
SPAM1	6677	sperm adhesion molecule 1 (PH-20 hyaluronidase, zona pellucida binding)	1.3
KCNAB1	7881	potassium voltage-gated channel, shaker-related subfamily, beta member 1	1.3
MYH14	79784	myosin, heavy polypeptide 14	1.3
COL27A1	85301	collagen, type XXVII, alpha 1	1.3
TSPAN18	90139	tetraspanin 18	1.3
FCER1G	2207	Fc fragment of IgE, high affinity I, receptor for; gamma polypeptide	1.3
SLC24A2	25769	solute carrier family 24 (sodium/potassium/calcium exchanger), member 2	1.3
PPARA	5465	peroxisome proliferative activated receptor, alpha	1.3
ABI2	10152	abl interactor 2	1.3
UNG2	10309	uracil-DNA glycosylase 2	1.3
POU6F2	11281	POU domain, class 6, transcription factor 2	1.3
AQP3	360	aquaporin 3 (Gill blood group)	1.3
LTBR	4055	lymphotoxin beta receptor (TNFR superfamily, member 3)	1.3
NOTCH4	4855	Notch homolog 4 (Drosophila)	1.3
SIGIRR	59307	single immunoglobulin and toll-interleukin 1 receptor (TIR) domain	1.3
CACNA1D	776	calcium channel, voltage-dependent, L type, alpha 1D subunit	1.3
FCHSD1	89848	FCH and double SH3 domains 1	1.3
MAB21L2	10586	mab-21-like 2 (C. elegans)	1.3
AK7	122481	adenylate kinase 7	1.3
CD93	22918	CD93 molecule	1.3
SLC40A1	30061	solute carrier family 40 (iron-regulated transporter), member 1	1.3
LAMA3	3909	laminin, alpha 3	1.3
CARD12	58484	caspase recruitment domain family, member 12	1.3
EPB41L4A	64097	erythrocyte membrane protein band 4.1 like 4A	1.3
MPZL1	9019	myelin protein zero-like 1	1.3
MVK	4598	mevalonate kinase (mevalonic aciduria)	1.3
RUFY2	55680	RUN and FYVE domain containing 2	1.3
ST8SIA2	8128	ST8 alpha-N-acetyl-neuraminide alpha-2,8-sialyltransferase 2	1.3
COL13A1	1305	collagen, type XIII, alpha 1	1.3
HMBS	3145	hydroxymethylbilane synthase	1.3
SCN1A	6323	sodium channel, voltage-gated, type I, alpha	1.3
USF1	7391	upstream transcription factor 1	1.3
RND2	8153	Rho family GTPase 2	1.3
MAFB	9935	v-maf musculoaponeurotic fibrosarcoma oncogene homolog B (avian)	1.3
FOXN4	121643	forkhead box N4	1.3



Table\_S2

CSF3	1440	colony stimulating factor 3 (granulocyte)	1.3
UNC13D	201294	unc-13 homolog D (C. elegans)	1.3
SSBP3	23648	single stranded DNA binding protein 3	1.3
GABRP	2568	gamma-aminobutyric acid (GABA) A receptor, pi	1.3
MAP2	4133	microtubule-associated protein 2	1.3
NDN	4692	necdin homolog (mouse)	1.3
FKBP7	51661	FK506 binding protein 7	1.3
PPP2R3A	5523	protein phosphatase 2 (formerly 2A), regulatory subunit B", alpha	1.3
MAP2K5	5607	mitogen-activated protein kinase kinase 5	1.3
TMOD1	7111	tropomodulin 1	1.3
AXIN2	8313	axin 2 (conductin, axil)	1.3
EPHB3	2049	EPH receptor B3	1.3
GM2A	2760	GM2 ganglioside activator	1.3
ANKFY1	51479	ankyrin repeat and FYVE domain containing 1	1.3
TFF2	7032	trefoil factor 2 (spasmolytic protein 1)	1.3
ZNF90	7643	zinc finger protein 90	1.3
EDG4	9170	endothelial differentiation, lysophosphatidic acid G-protein-coupled receptor, 4	1.3
MUC15	143662	mucin 15, cell surface associated	1.3
EPB41L3	23136	erythrocyte membrane protein band 4.1-like 3	1.3
TJP3	27134	tight junction protein 3 (zona occludens 3)	1.3
PURG	29942	purine-rich element binding protein G	1.3
ATP2B2	491	ATPase, Ca <sup>++</sup> transporting, plasma membrane 2	1.3
BCOR	54880	BCL6 co-repressor	1.3
BAIAP2L1	55971	BAI1-associated protein 2-like 1	1.3
RASAL2	9462	RAS protein activator like 2	1.3
CHST4	10164	carbohydrate (N-acetylglucosamine 6-O) sulfotransferase 4	1.3
IGSF4D	253559	immunoglobulin superfamily, member 4D	1.3
NOX1	27035	NADPH oxidase 1	1.3
ST7L	54879	suppression of tumorigenicity 7 like	1.3
ZNF214	7761	zinc finger protein 214	1.3
RAB36	9609	RAB36, member RAS oncogene family	1.3
ZNF396	252884	zinc finger protein 396	1.3
OAS2	4939	2'-5'-oligoadenylate synthetase 2, 69/71kDa	1.3
SLC8A1	6546	solute carrier family 8 (sodium/calcium exchanger), member 1	1.3
SRC	6714	v-src sarcoma (Schmidt-Ruppin A-2) viral oncogene homolog (avian)	1.3
NEBL	10529	nebulette	1.3
ADH7	131	alcohol dehydrogenase 7 (class IV), mu or sigma polypeptide	1.3



Table\_S2

DYX1C1	161582	dyslexia susceptibility 1 candidate 1	1.3
CECR2	27443	cat eye syndrome chromosome region, candidate 2	1.3
HSPB2	3316	heat shock 27kDa protein 2	1.3
MUC4	4585	mucin 4, cell surface associated	1.3
BMP7	655	bone morphogenetic protein 7 (osteogenic protein 1)	1.3
SOX13	9580	SRY (sex determining region Y)-box 13	1.3
FAT3	120114	FAT tumor suppressor homolog 3 (Drosophila)	1.3
RASEF	158158	RAS and EF-hand domain containing	1.3
CDC42EP4	23580	CDC42 effector protein (Rho GTPase binding) 4	1.3
MSRB3	253827	methionine sulfoxide reductase B3	1.3
GNA11	2767	guanine nucleotide binding protein (G protein), alpha 11 (Gq class)	1.3
KCNQ2	3785	potassium voltage-gated channel, KQT-like subfamily, member 2	1.3
RPS6KA2	6196	ribosomal protein S6 kinase, 90kDa, polypeptide 2	1.3
TIMP3	7078	TIMP metalloproteinase inhibitor 3 (Sorsby fundus dystrophy, pseudoinflammatory)	1.3
SORBS2	8470	sorbin and SH3 domain containing 2	1.3
APC2	10297	adenomatous polyposis coli 2	1.3
TDRKH	11022	tudor and KH domain containing	1.3
NFASC	23114	neurofascin homolog (chicken)	1.3
GLS2	27165	glutaminase 2 (liver, mitochondrial)	1.3
CARD10	29775	caspase recruitment domain family, member 10	1.3
MC2R	4158	melanocortin 2 receptor (adrenocorticotrophic hormone)	1.3
OPRM1	4988	opioid receptor, mu 1	1.3
PEG3	5178	paternally expressed 3	1.3
CACNB2	783	calcium channel, voltage-dependent, beta 2 subunit	1.3
SLC14A2	8170	solute carrier family 14 (urea transporter), member 2	1.3
PUNC	9543	putative neuronal cell adhesion molecule	1.3
FCAR	2204	Fc fragment of IgA, receptor for	1.3
NBEA	26960	neurobeachin	1.3
GPR160	26996	G protein-coupled receptor 160	1.3
HOXC4	3221	homeobox C4	1.3
LLGL1	3996	lethal giant larvae homolog 1 (Drosophila)	1.3
RBP1	5947	retinol binding protein 1, cellular	1.3
TGM2	7052	transglutaminase 2 (C polypeptide, protein-glutamine-gamma-glutamyltransferase)	1.3
TRIM25	7706	tripartite motif-containing 25	1.3
NOX5	79400	NADPH oxidase, EF-hand calcium binding domain 5	1.3
CLGN	1047	calmegin	1.3
CIB2	10518	calcium and integrin binding family member 2	1.3

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ADCY9	115	adenylate cyclase 9	1.3
SLC24A3	57419	solute carrier family 24 (sodium/potassium/calcium exchanger), member 3	1.3
IL27	246778	interleukin 27	1.3
PCTK3	5129	PCTAIRE protein kinase 3	1.3
SCARA3	51435	scavenger receptor class A, member 3	1.3
IL17RB	55540	interleukin 17 receptor B	1.3
PSG9	5678	pregnancy specific beta-1-glycoprotein 9	1.3
C20orf67	63935	chromosome 20 open reading frame 67	1.3
ZNF3	7551	zinc finger protein 3	1.3
ASAP	79884	aster-associated protein	1.3
COL10A1	1300	collagen, type X, alpha 1(Schmid metaphyseal chondrodysplasia)	1.3
MUC20	200958	mucin 20, cell surface associated	1.3
CNGB3	54714	cyclic nucleotide gated channel beta 3	1.3
HTRA1	5654	HtrA serine peptidase 1	1.3
BCHE	590	butyrylcholinesterase	1.3
SLC8A3	6547	solute carrier family 8 (sodium-calcium exchanger), member 3	1.3
SH2D3A	10045	SH2 domain containing 3A	1.3
ADRB3	155	adrenergic, beta-3-, receptor	1.3
EBF3	253738	early B-cell factor 3	1.3
SLC2A2	6514	solute carrier family 2 (facilitated glucose transporter), member 2	1.3
SMC1L1	8243	SMC1 structural maintenance of chromosomes 1-like 1 (yeast)	1.3
BCL2L11	10018	BCL2-like 11 (apoptosis facilitator)	1.3
CRH	1392	corticotropin releasing hormone	1.3
GRIA3	2892	glutamate receptor, ionotropic, AMPA 3	1.3
JUN	3725	v-jun sarcoma virus 17 oncogene homolog (avian)	1.3
HR	55806	hairless homolog (mouse)	1.3
STATH	6779	statherin	1.3
PRRT1	80863	proline-rich transmembrane protein 1	1.3
EMP2	2013	epithelial membrane protein 2	1.3
OR11A1	26531	olfactory receptor, family 11, subfamily A, member 1	1.3
GPR4	2828	G protein-coupled receptor 4	1.3
GRIN2D	2906	glutamate receptor, ionotropic, N-methyl D-aspartate 2D	1.3
APOA2	336	apolipoprotein A-II	1.3
MT1F	4494	metallothionein 1F (functional)	1.3
PPP1R9A	55607	protein phosphatase 1, regulatory (inhibitor) subunit 9A	1.3
DNAJC12	56521	DnaJ (Hsp40) homolog, subfamily C, member 12	1.3
RGS4	5999	regulator of G-protein signalling 4	1.3

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USH3A	7401	Usher syndrome 3A	1.3
AP3S2	10239	adaptor-related protein complex 3, sigma 2 subunit	1.3
KIF1C	10749	kinesin family member 1C	1.3
COL2A1	1280	collagen, type II, alpha 1 (primary osteoarthritis, spondyloepiphyseal dysplasia, congenital)	1.3
CNTNAP2	26047	contactin associated protein-like 2	1.3
SLC10A1	6554	solute carrier family 10 (sodium/bile acid cotransporter family), member 1	1.3
MFAP5	8076	microfibrillar associated protein 5	1.3
CASP2	835	caspase 2, apoptosis-related cysteine peptidase (neural precursor cell expressed, developmentally down-regulated)	1.3
IL17RC	84818	interleukin 17 receptor C	1.3
ABCB11	8647	ATP-binding cassette, sub-family B (MDR/TAP), member 11	1.3
RRP22	10633	RAS-related on chromosome 22	1.3
PNMA2	10687	paraneoplastic antigen MA2	1.3
DLX2	1746	distal-less homeobox 2	1.3
GGN	199720	gametogenetin	1.3
CXCL1	2919	chemokine (C-X-C motif) ligand 1 (melanoma growth stimulating activity, alpha)	1.3
CORO1B	57175	coronin, actin binding protein, 1B	1.3
USP28	57646	ubiquitin specific peptidase 28	1.3
APBA2BP	63941	amyloid beta (A4) precursor protein-binding, family A, member 2 binding protein	1.3
RTP3	83597	receptor transporter protein 3	1.3
NAV3	89795	neuron navigator 3	1.3
DOC1	11259	downregulated in ovarian cancer 1	1.3
COL4A6	1288	collagen, type IV, alpha 6	1.3
CTCF	140690	CCCTC-binding factor (zinc finger protein)-like	1.3
IL1RAPL2	26280	interleukin 1 receptor accessory protein-like 2	1.3
ACTL6B	51412	actin-like 6B	1.3
CCL18	6362	chemokine (C-C motif) ligand 18 (pulmonary and activation-regulated)	1.3
TBX3	6926	T-box 3 (ulnar mammary syndrome)	1.3
CILP	8483	cartilage intermediate layer protein, nucleotide pyrophosphohydrolase	1.3
ITGB1BP1	9270	integrin beta 1 binding protein 1	1.3
MAGEC1	9947	melanoma antigen family C, 1	1.3
NKX2-5	1482	NK2 transcription factor related, locus 5 (Drosophila)	1.2
ERBB3	2065	v-erb-b2 erythroblastic leukemia viral oncogene homolog 3 (avian)	1.2
WBP1	23559	WW domain binding protein 1	1.2
SEPT3	55964	septin 3	1.2
ADAMTS9	56999	ADAM metallopeptidase with thrombospondin type 1 motif, 9	1.2
SCNN1A	6337	sodium channel, nonvoltage-gated 1 alpha	1.2
THPO	7066	thrombopoietin (myeloproliferative leukemia virus oncogene ligand, megakaryocyte growth and development factor)	1.2

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CRYBA1	1411	crystallin, beta A1	1.2
CYR61	3491	cysteine-rich, angiogenic inducer, 61	1.2
AQP4	361	aquaporin 4	1.2
TACR1	6869	tachykinin receptor 1	1.2
CNN2	1265	calponin 2	1.2
IL1F7	27178	interleukin 1 family, member 7 (zeta)	1.2
MAP3K9	4293	mitogen-activated protein kinase kinase kinase 9	1.2
CLEC7A	64581	C-type lectin domain family 7, member A	1.2
BCL2L14	79370	BCL2-like 14 (apoptosis facilitator)	1.2
PRSS12	8492	protease, serine, 12 (neurotrypsin, motopsin)	1.2
COL6A1	1291	collagen, type VI, alpha 1	1.2
CP	1356	ceruloplasmin (ferroxidase)	1.2
CHD5	26038	chromodomain helicase DNA binding protein 5	1.2
PDE7B	27115	phosphodiesterase 7B	1.2
GNRHR	2798	gonadotropin-releasing hormone receptor	1.2
HTR1B	3351	5-hydroxytryptamine (serotonin) receptor 1B	1.2
YLP1	56252	YLP motif containing 1	1.2
SLC13A3	64849	solute carrier family 13 (sodium-dependent dicarboxylate transporter), member 3	1.2
BMP1	649	bone morphogenetic protein 1	1.2
CPE	1363	carboxypeptidase E	1.2
ARHGAP2	23092	Rho GTPase activating protein 26	1.2
SIRT3	23410	sirtuin (silent mating type information regulation 2 homolog) 3 (S. cerevisiae)	1.2
APLP1	333	amyloid beta (A4) precursor-like protein 1	1.2
PAX9	5083	paired box gene 9	1.2
GPR137	56834	G protein-coupled receptor 137	1.2
CAPN6	827	calpain 6	1.2
GPR123	84435	G protein-coupled receptor 123	1.2
C3orf15	89876	chromosome 3 open reading frame 15	1.2
ADAMTS5	11096	ADAM metalloproteinase with thrombospondin type 1 motif, 5 (aggrecanase-2)	1.2
NAPE-PLD	222236	N-acyl-phosphatidylethanolamine-hydrolyzing phospholipase D	1.2
ALOX5AP	241	arachidonate 5-lipoxygenase-activating protein	1.2
COPG2	26958	coatamer protein complex, subunit gamma 2	1.2
GRIN1	2902	glutamate receptor, ionotropic, N-methyl D-aspartate 1	1.2
MMP17	4326	matrix metalloproteinase 17 (membrane-inserted)	1.2
TNFRSF11	4982	tumor necrosis factor receptor superfamily, member 11b (osteoprotegerin)	1.2
AGPAT3	56894	1-acylglycerol-3-phosphate O-acyltransferase 3	1.2
ZFYVE20	64145	zinc finger, FYVE domain containing 20	1.2

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NOL3	8996	nucleolar protein 3 (apoptosis repressor with CARD domain)	1.2
CREB3L1	90993	cAMP responsive element binding protein 3-like 1	1.2
AHSG	197	alpha-2-HS-glycoprotein	1.2
NF1	4763	neurofibromin 1 (neurofibromatosis, von Recklinghausen disease, Watson disease)	1.2
PCSK6	5046	proprotein convertase subtilisin/kexin type 6	1.2
PAX6	5080	paired box gene 6 (aniridia, keratitis)	1.2
ATP6V0A1	535	ATPase, H <sup>+</sup> transporting, lysosomal V0 subunit a1	1.2
DNAH3	55567	dynein, axonemal, heavy polypeptide 3	1.2
GPR135	64582	G protein-coupled receptor 135	1.2
CXCR6	10663	chemokine (C-X-C motif) receptor 6	1.2
CHRNA3	1136	cholinergic receptor, nicotinic, alpha 3	1.2
CNR2	1269	cannabinoid receptor 2 (macrophage)	1.2
ADRBK1	156	adrenergic, beta, receptor kinase 1	1.2
PLAUR	5329	plasminogen activator, urokinase receptor	1.2
KLK15	55554	kallikrein 15	1.2
BRUNOL4	56853	bruno-like 4, RNA binding protein (Drosophila)	1.2
TWSG1	57045	twisted gastrulation homolog 1 (Drosophila)	1.2
ATP10A	57194	ATPase, Class V, type 10A	1.2
CADPS2	93664	Ca <sup>2+</sup> -dependent activator protein for secretion 2	1.2
COL4A5	1287	collagen, type IV, alpha 5 (Alport syndrome)	1.2
ELN	2006	elastin (supravalvular aortic stenosis, Williams-Beuren syndrome)	1.2
GPR21	2844	G protein-coupled receptor 21	1.2
KCNN3	3782	potassium intermediate/small conductance calcium-activated channel, subfamily N, member 3	1.2
TACSTD2	4070	tumor-associated calcium signal transducer 2	1.2
MARK1	4139	MAP/microtubule affinity-regulating kinase 1	1.2
PECAM1	5175	platelet/endothelial cell adhesion molecule (CD31 antigen)	1.2
PAG1	55824	phosphoprotein associated with glycosphingolipid microdomains 1	1.2
BBS4	585	Bardet-Biedl syndrome 4	1.2
SLCO1A2	6579	solute carrier organic anion transporter family, member 1A2	1.2
TTN	7273	titin	1.2
NUAK2	81788	NUAK family, SNF1-like kinase, 2	1.2
TNFSF15	9966	tumor necrosis factor (ligand) superfamily, member 15	1.2
CYB561	1534	cytochrome b-561	1.2
FGFR4	2264	fibroblast growth factor receptor 4	1.2
NALP1	22861	NACHT, leucine rich repeat and PYD (pyrin domain) containing 1	1.2
GRM1	2911	glutamate receptor, metabotropic 1	1.2
SNX12	29934	sorting nexin 12	1.2

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APOB	338	apolipoprotein B (including Ag(x) antigen)	1.2
ASB4	51666	ankyrin repeat and SOCS box-containing 4	1.2
RNF17	56163	ring finger protein 17	1.2
PRDM16	63976	PR domain containing 16	1.2
MSC	9242	musculin (activated B-cell factor-1)	1.2
B3GNT7	93010	UDP-GlcNAc:betaGal beta-1,3-N-acetylglucosaminyltransferase 7	1.2
CHRM3	1131	cholinergic receptor, muscarinic 3	1.2
COL1A2	1278	collagen, type I, alpha 2	1.2
GPX5	2880	glutathione peroxidase 5 (epididymal androgen-related protein)	1.2
KLK2	3817	kallikrein 2, prostatic	1.2
LIMK1	3984	LIM domain kinase 1	1.2
CD248	57124	CD248 molecule, endosialin	1.2
ROBO2	6092	roundabout, axon guidance receptor, homolog 2 (Drosophila)	1.2
COL12A1	1303	collagen, type XII, alpha 1	1.2
TSC22D3	1831	TSC22 domain family, member 3	1.2
GABRB3	2562	gamma-aminobutyric acid (GABA) A receptor, beta 3	1.2
GRLF1	2909	glucocorticoid receptor DNA binding factor 1	1.2
MOCS1	4337	molybdenum cofactor synthesis 1	1.2
PANK1	53354	pantothenate kinase 1	1.2
SLC6A20	54716	solute carrier family 6 (proline IMINO transporter), member 20	1.2
SYNJ2	8871	synaptojanin 2	1.2
LHX4	89884	LIM homeobox 4	1.2
SEMA3A	10371	sema domain, immunoglobulin domain (Ig), short basic domain, secreted, (semaphorin) 3A	1.2
DMD	1756	dystrophin (muscular dystrophy, Duchenne and Becker types)	1.2
EPHX2	2053	epoxide hydrolase 2, cytoplasmic	1.2
HAL	3034	histidine ammonia-lyase	1.2
KCNJ8	3764	potassium inwardly-rectifying channel, subfamily J, member 8	1.2
PI3	5266	peptidase inhibitor 3, skin-derived (SKALP)	1.2
TGFA	7039	transforming growth factor, alpha	1.2
SAP130	79595	Sin3A-associated protein, 130kDa	1.2
USP2	9099	ubiquitin specific peptidase 2	1.2
NEU3	10825	sialidase 3 (membrane sialidase)	1.2
EPHB2	2048	EPH receptor B2	1.2
GHRHR	2692	growth hormone releasing hormone receptor	1.2
GJB5	2709	gap junction protein, beta 5 (connexin 31.1)	1.2
MYL4	4635	myosin, light polypeptide 4, alkali; atrial, embryonic	1.2
PHF1	5252	PHD finger protein 1	1.2

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PHF12	57649	PHD finger protein 12	1.2
PXDN	7837	peroxidasin homolog (Drosophila)	1.2
CLCA2	9635	chloride channel, calcium activated, family member 2	1.2
MERTK	10461	c-mer proto-oncogene tyrosine kinase	1.2
DACH1	1602	dachshund homolog 1 (Drosophila)	1.2
DGKA	1606	diacylglycerol kinase, alpha 80kDa	1.2
DLG2	1740	discs, large homolog 2, chapsyn-110 (Drosophila)	1.2
KCNIP2	30819	Kv channel interacting protein 2	1.2
MOV10	4343	Mov10, Moloney leukemia virus 10, homolog (mouse)	1.2
ROR1	4919	receptor tyrosine kinase-like orphan receptor 1	1.2
SOST	50964	sclerosteosis	1.2
CTDSPL	10217	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase-like	1.2
RRAGB	10325	Ras-related GTP binding B	1.2
LZTS1	11178	leucine zipper, putative tumor suppressor 1	1.2
HCFC1	3054	host cell factor C1 (VP16-accessory protein)	1.2
NFKBIL2	4796	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor-like 2	1.2
IGSF4B	57863	immunoglobulin superfamily, member 4B	1.2
TEF	7008	thyrotrophic embryonic factor	1.2
ZNF187	7741	zinc finger protein 187	1.2
TKTL2	84076	transketolase-like 2	1.2
TRAF4	9618	TNF receptor-associated factor 4	1.2
PRDM5	11107	PR domain containing 5	1.2
CYP3A5	1577	cytochrome P450, family 3, subfamily A, polypeptide 5	1.2
PRPF6	24148	PRP6 pre-mRNA processing factor 6 homolog (S. cerevisiae)	1.2
GAB1	2549	GRB2-associated binding protein 1	1.2
SFN	2810	stratifin	1.2
ANK2	287	ankyrin 2, neuronal	1.2
FAM102A	399665	family with sequence similarity 102, member A	1.2
MAPT	4137	microtubule-associated protein tau	1.2
CC2D1A	54862	coiled-coil and C2 domain containing 1A	1.2
SOX4	6659	SRY (sex determining region Y)-box 4	1.2
TRO	7216	trophinin	1.2
CBFA2T2	9139	core-binding factor, runt domain, alpha subunit 2; translocated to, 2	1.2
GLYAT	10249	glycine-N-acyltransferase	1.2
WDR6	11180	WD repeat domain 6	1.2
STAB1	23166	stabilin 1	1.2
STXBP6	29091	syntaxin binding protein 6 (amisyn)	1.2



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CPSF1	29894	cleavage and polyadenylation specific factor 1, 160kDa	1.2
TLX3	30012	T-cell leukemia homeobox 3	1.2
FLJ21736	79984	esterase 31	1.2
IL1RL2	8808	interleukin 1 receptor-like 2	1.2
CLDN4	1364	claudin 4	1.2
CR1	1378	complement component (3b/4b) receptor 1 (Knops blood group)	1.2
KHDRBS2	202559	KH domain containing, RNA binding, signal transduction associated 2	1.2
ZNF521	25925	zinc finger protein 521	1.2
HOXB7	3217	homeobox B7	1.2
NCF2	4688	neutrophil cytosolic factor 2 (65kDa, chronic granulomatous disease, autosomal 2)	1.2
ATP1A4	480	ATPase, Na+/K+ transporting, alpha 4 polypeptide	1.2
PRB1	5542	proline-rich protein BstNI subfamily 1	1.2
PTGS1	5742	prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase)	1.2
SCN2B	6327	sodium channel, voltage-gated, type II, beta	1.2
SFTPC	6440	surfactant, pulmonary-associated protein C	1.2
DDHD1	80821	DDHD domain containing 1	1.2
IGFBP5	3488	insulin-like growth factor binding protein 5	1.2
CAMK1D	57118	calcium/calmodulin-dependent protein kinase ID	1.2
CA6	765	carbonic anhydrase VI	1.2
CPT1A	1374	carnitine palmitoyltransferase 1A (liver)	1.2
IL23R	149233	interleukin 23 receptor	1.2
NR5A2	2494	nuclear receptor subfamily 5, group A, member 2	1.2
RHOD	29984	ras homolog gene family, member D	1.2
ACACB	32	acetyl-Coenzyme A carboxylase beta	1.2
MOG	4340	myelin oligodendrocyte glycoprotein	1.2
MYO7A	4647	myosin VIIA	1.2
ATP1B1	481	ATPase, Na+/K+ transporting, beta 1 polypeptide	1.2
NPPB	4879	natriuretic peptide precursor B	1.2
ANAPC11	51529	APC11 anaphase promoting complex subunit 11 homolog (yeast)	1.2
JPH3	57338	junctionophilin 3	1.2
DUSP10	11221	dual specificity phosphatase 10	1.2
DRD2	1813	dopamine receptor D2	1.2
ALOX15B	247	arachidonate 15-lipoxygenase, type B	1.2
GABRA1	2554	gamma-aminobutyric acid (GABA) A receptor, alpha 1	1.2
HFE	3077	hemochromatosis	1.2
HNF4A	3172	hepatocyte nuclear factor 4, alpha	1.2
ITGAM	3684	integrin, alpha M (complement component 3 receptor 3 subunit)	1.2



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TRPV2	51393	transient receptor potential cation channel, subfamily V, member 2	1.2
SLC2A4RC	56731	SLC2A4 regulator	1.2
CCL24	6369	chemokine (C-C motif) ligand 24	1.2
FAM12A	10876	family with sequence similarity 12, member A	1.2
ZNF540	163255	zinc finger protein 540	1.2
HOXA11S	221883	homeo box A11, antisense	1.2
ZC3H7B	23264	zinc finger CCCH-type containing 7B	1.2
HSD17B2	3294	hydroxysteroid (17-beta) dehydrogenase 2	1.2
ARSD	414	arylsulfatase D	1.2
NFIB	4781	nuclear factor I/B	1.2
PAX3	5077	paired box gene 3 (Waardenburg syndrome 1)	1.2
ZBTB7A	51341	zinc finger and BTB domain containing 7A	1.2
GPR84	53831	G protein-coupled receptor 84	1.2
ZNF312	55079	zinc finger protein 312	1.2
PORCN	64840	porcupine homolog (Drosophila)	1.2
PTPN5	84867	protein tyrosine phosphatase, non-receptor type 5 (striatum-enriched)	1.2
ELK1	2002	ELK1, member of ETS oncogene family	1.2
FPRL2	2359	formyl peptide receptor-like 2	1.2
BCL6B	255877	B-cell CLL/lymphoma 6, member B (zinc finger protein)	1.2
B4GALT1	2683	UDP-Gal:betaGlcNAc beta 1,4- galactosyltransferase, polypeptide 1	1.2
ILDR1	286676	immunoglobulin-like domain containing receptor 1	1.2
GRIK2	2898	glutamate receptor, ionotropic, kainate 2	1.2
MUC6	4588	mucin 6, oligomeric mucus/gel-forming	1.2
NOTCH2	4853	Notch homolog 2 (Drosophila)	1.2
SYT4	6860	synaptotagmin IV	1.2
KLRG1	10219	killer cell lectin-like receptor subfamily G, member 1	1.2
XLKD1	10894	extracellular link domain containing 1	1.2
ALS2CR19	117583	amyotrophic lateral sclerosis 2 (juvenile) chromosome region, candidate 19	1.2
ZNF641	121274	zinc finger protein 641	1.2
CSF1	1435	colony stimulating factor 1 (macrophage)	1.2
SH3D19	152503	SH3 domain protein D19	1.2
MPZ	4359	myelin protein zero (Charcot-Marie-Tooth neuropathy 1B)	1.2
CLDN18	51208	claudin 18	1.2
PLD2	5338	phospholipase D2	1.2
TIMP2	7077	TIMP metalloproteinase inhibitor 2	1.2
TNK2	10188	tyrosine kinase, non-receptor, 2	1.2
LEFTY1	10637	left-right determination factor 1	1.2

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DLX4	1748	distal-less homeobox 4	1.2
TPCN1	53373	two pore segment channel 1	1.2
TMEM16A	55107	transmembrane protein 16A	1.2
SIRPG	55423	signal-regulatory protein gamma	1.2
PTN	5764	pleiotrophin (heparin binding growth factor 8, neurite growth-promoting factor 1)	1.2
EPS8L2	64787	EPS8-like 2	1.2
C1QTNF1	114897	C1q and tumor necrosis factor related protein 1	1.2
COL4A3	1285	collagen, type IV, alpha 3 (Goodpasture antigen)	1.2
ADRA1D	146	adrenergic, alpha-1D-, receptor	1.2
EDNRA	1909	endothelin receptor type A	1.2
CES7	221223	carboxylesterase 7	1.2
PNMA3	29944	paraneoplastic antigen MA3	1.2
RRAS	6237	related RAS viral (r-ras) oncogene homolog	1.2
RTN1	6252	reticulon 1	1.2
PDXK	8566	pyridoxal (pyridoxine, vitamin B6) kinase	1.2
CHGA	1113	chromogranin A (parathyroid secretory protein 1)	1.2
VSIG4	11326	V-set and immunoglobulin domain containing 4	1.2
CILP2	148113	cartilage intermediate layer protein 2	1.2
MARK2	2011	MAP/microtubule affinity-regulating kinase 2	1.2
PTHB1	27241	parathyroid hormone-responsive B1	1.2
KRTAP19-	337970	keratin associated protein 19-3	1.2
LEPR	3953	leptin receptor	1.2
ST8SIA3	51046	ST8 alpha-N-acetyl-neuraminide alpha-2,8-sialyltransferase 3	1.2
ZNF407	55628	zinc finger protein 407	1.2
AZGP1	563	alpha-2-glycoprotein 1, zinc	1.2
RRAD	6236	Ras-related associated with diabetes	1.2
ZNF10	7556	zinc finger protein 10	1.2
CACNA1A	773	calcium channel, voltage-dependent, P/Q type, alpha 1A subunit	1.2
GTPBP1	9567	GTP binding protein 1	1.2
ADCY1	107	adenylate cyclase 1 (brain)	1.2
AGC1	176	aggrecan 1 (chondroitin sulfate proteoglycan 1, large aggregating proteoglycan, antigen identified by monoclonal	1.2
PIB5PA	27124	phosphatidylinositol (4,5) bisphosphate 5-phosphatase, A	1.2
AFF4	27125	AF4/FMR2 family, member 4	1.2
PAX1	5075	paired box gene 1	1.2
TBC1D10A	83874	TBC1 domain family, member 10A	1.2
PSCD3	9265	pleckstrin homology, Sec7 and coiled-coil domains 3	1.2
JUND	3727	jun D proto-oncogene	1.2

Table\_S2

NPPA	4878	natriuretic peptide precursor A	1.2
WDR71	80227	WD repeat domain 71	1.2
PNPLA3	80339	patatin-like phospholipase domain containing 3	1.2
SLC16A5	9121	solute carrier family 16 (monocarboxylic acid transporters), member 5	1.2
BCL2L10	10017	BCL2-like 10 (apoptosis facilitator)	1.2
LILRA2	11027	leukocyte immunoglobulin-like receptor, subfamily A (with TM domain), member 2	1.2
ADRA2C	152	adrenergic, alpha-2C-, receptor	1.2
CYBB	1536	cytochrome b-245, beta polypeptide (chronic granulomatous disease)	1.2
EPHA1	2041	EPH receptor A1	1.2
G6PC	2538	glucose-6-phosphatase, catalytic (glycogen storage disease type I, von Gierke disease)	1.2
KCNE1	3753	potassium voltage-gated channel, Isk-related family, member 1	1.2
MMP19	4327	matrix metalloproteinase 19	1.2
TFAP2C	7022	transcription factor AP-2 gamma (activating enhancer binding protein 2 gamma)	1.2
SLC13A2	9058	solute carrier family 13 (sodium-dependent dicarboxylate transporter), member 2	1.2
CAND2	23066	cullin-associated and neddylation-dissociated 2 (putative)	1.2
HMOX1	3162	heme oxygenase (decycling) 1	1.2
IGF1	3479	insulin-like growth factor 1 (somatomedin C)	1.2
CGN	57530	cingulin	1.2
VMP	140767	vesicular membrane protein p24	1.2
PDZD2	23037	PDZ domain containing 2	1.2
CLDN14	23562	claudin 14	1.2
TAB3	257397	TAK1-binding protein 3	1.2
FOXA2	3170	forkhead box A2	1.2
ZMYND10	51364	zinc finger, MYND-type containing 10	1.2
WWOX	51741	WW domain containing oxidoreductase	1.2
LY6K	54742	lymphocyte antigen 6 complex, locus K	1.2
KCNH7	90134	potassium voltage-gated channel, subfamily H (eag-related), member 7	1.2
SSX2IP	117178	synovial sarcoma, X breakpoint 2 interacting protein	1.2
EMX2OS	196047	empty spiracles homolog 2 (Drosophila) opposite strand	1.2
AMBN	258	ameloblastin (enamel matrix protein)	1.2
IL29	282618	interleukin 29 (interferon, lambda 1)	1.2
ARRB1	408	arrestin, beta 1	1.2
PLCB4	5332	phospholipase C, beta 4	1.2
PPBP	5473	pro-platelet basic protein (chemokine (C-X-C motif) ligand 7)	1.2
NXN	64359	nucleoredoxin	1.2
NXPH4	11247	neurexophilin 4	1.2
SLC2A13	114134	solute carrier family 2 (facilitated glucose transporter), member 13	1.2

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PTRF	284119	polymerase I and transcript release factor	1.2
KIR2DL4	3805	killer cell immunoglobulin-like receptor, two domains, long cytoplasmic tail, 4	1.2
XDH	7498	xanthine dehydrogenase	1.2
MAP3K12	7786	mitogen-activated protein kinase kinase kinase 12	1.2
PAR6B	84612	par-6 partitioning defective 6 homolog beta (C. elegans)	1.2
SHC2	25759	SHC (Src homology 2 domain containing) transforming protein 2	1.2
SIGLEC7	27036	sialic acid binding Ig-like lectin 7	1.2
LTK	4058	leukocyte tyrosine kinase	1.2
CEACAM6	4680	carcinoembryonic antigen-related cell adhesion molecule 6 (non-specific cross reacting antigen)	1.2
TMEPAI	56937	transmembrane, prostate androgen induced RNA	1.2
REEP1	65055	receptor accessory protein 1	1.2
PDZD3	79849	PDZ domain containing 3	1.2
HDAC11	79885	histone deacetylase 11	1.2
CACNA1G	8913	calcium channel, voltage-dependent, alpha 1G subunit	1.2
ADCK2	90956	aaRF domain containing kinase 2	1.2
HELB	92797	helicase (DNA) B	1.2
GIMAP8	155038	GTPase, IMAP family member 8	1.2
F13A1	2162	coagulation factor XIII, A1 polypeptide	1.2
SLC44A1	23446	solute carrier family 44, member 1	1.2
GBX2	2637	gastrulation brain homeobox 2	1.2
KCNC1	3746	potassium voltage-gated channel, Shaw-related subfamily, member 1	1.2
PDE4D	5144	phosphodiesterase 4D, cAMP-specific (phosphodiesterase E3 dunce homolog, Drosophila)	1.2
DYNC2LI1	51626	dynein, cytoplasmic 2, light intermediate chain 1	1.2
AVPR1A	552	arginine vasopressin receptor 1A	1.2
KAZALD1	81621	Kazal-type serine peptidase inhibitor domain 1	1.2
RUNX1T1	862	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	1.2
KLF4	9314	Kruppel-like factor 4 (gut)	1.2
COX7A1	1346	cytochrome c oxidase subunit VIIa polypeptide 1 (muscle)	1.2
FGF11	2256	fibroblast growth factor 11	1.2
TNNC1	7134	troponin C type 1 (slow)	1.2
XPNPEP2	7512	X-prolyl aminopeptidase (aminopeptidase P) 2, membrane-bound	1.2
CA1	759	carbonic anhydrase I	1.2
PDPN	10630	podoplanin	1.2
GLRB	2743	glycine receptor, beta	1.2
TBXA2R	6915	thromboxane A2 receptor	1.2
IL5RA	3568	interleukin 5 receptor, alpha	1.2
ARNTL	406	aryl hydrocarbon receptor nuclear translocator-like	1.2

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MITF	4286	microphthalmia-associated transcription factor	1.2
KIF1A	547	kinesin family member 1A	1.2
MKS1	54903	Meckel syndrome, type 1	1.2
PAPOLB	56903	poly(A) polymerase beta (testis specific)	1.2
MKL2	57496	MKL/myocardin-like 2	1.2
AURKC	6795	aurora kinase C	1.2
GRHPR	9380	glyoxylate reductase/hydroxypyruvate reductase	1.2
TRIM9	114088	tripartite motif-containing 9	1.2
NLGN3	54413	neuroligin 3	1.2
TFDP2	7029	transcription factor Dp-2 (E2F dimerization partner 2)	1.2
UCP3	7352	uncoupling protein 3 (mitochondrial, proton carrier)	1.2
DYNC2H1	79659	dynein, cytoplasmic 2, heavy chain 1	1.2
CASP1	834	caspase 1, apoptosis-related cysteine peptidase (interleukin 1, beta, convertase)	1.2
GPR98	84059	G protein-coupled receptor 98	1.2
PIK3R3	8503	phosphoinositide-3-kinase, regulatory subunit 3 (p55, gamma)	1.2
CTDSP2	10106	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase 2	1.2
ABCC13	150000	ATP-binding cassette, sub-family C (CFTR/MRP), member 13	1.2
APOBEC3	200315	apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like 3A	1.2
FGFR3	2261	fibroblast growth factor receptor 3 (achondroplasia, thanatophoric dwarfism)	1.2
SHANK2	22941	SH3 and multiple ankyrin repeat domains 2	1.2
FLI1	2313	Friend leukemia virus integration 1	1.2
IL18	3606	interleukin 18 (interferon-gamma-inducing factor)	1.2
KHK	3795	ketoheokinase (fructokinase)	1.2
MMP15	4324	matrix metalloproteinase 15 (membrane-inserted)	1.2
AASS	10157	aminoadipate-semialdehyde synthase	1.2
DTNA	1837	dystrobrevin, alpha	1.2
P2RX2	22953	purinergic receptor P2X, ligand-gated ion channel, 2	1.2
GCG	2641	glucagon	1.2
EDG8	53637	endothelial differentiation, sphingolipid G-protein-coupled receptor, 8	1.2
ROBO4	54538	roundabout homolog 4, magic roundabout (Drosophila)	1.2
TNFAIP6	7130	tumor necrosis factor, alpha-induced protein 6	1.2
USP42	84132	ubiquitin specific peptidase 42	1.2
ZNF587	84914	zinc finger protein 587	1.2
CDC25A	993	cell division cycle 25A	1.2
MRVI1	10335	murine retrovirus integration site 1 homolog	1.2
CSRP2	1466	cysteine and glycine-rich protein 2	1.2
ABCD2	225	ATP-binding cassette, sub-family D (ALD), member 2	1.2

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H2AFX	3014	H2A histone family, member X	1.2
PCYT1B	9468	phosphate cytidyltransferase 1, choline, beta	1.2
SPAG6	9576	sperm associated antigen 6	1.2
CGA	1081	glycoprotein hormones, alpha polypeptide	1.2
ETV1	2115	ets variant gene 1	1.2
VSX1	30813	visual system homeobox 1 homolog, CHX10-like (zebrafish)	1.2
MSH4	4438	mutS homolog 4 (E. coli)	1.2
ATP1A3	478	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 3 polypeptide	1.2
NFYC	4802	nuclear transcription factor Y, gamma	1.2
PBX1	5087	pre-B-cell leukemia transcription factor 1	1.2
GPR52	9293	G protein-coupled receptor 52	1.2
SMG7	9887	Smg-7 homolog, nonsense mediated mRNA decay factor (C. elegans)	1.2
RASA3	22821	RAS p21 protein activator 3	1.2
BSC12	26580	Bernardinelli-Seip congenital lipodystrophy 2 (seipin)	1.2
GPX2	2877	glutathione peroxidase 2 (gastrointestinal)	1.2
STS	412	steroid sulfatase (microsomal), arylsulfatase C, isozyme S	1.2
SERPINC1	462	serpin peptidase inhibitor, clade C (antithrombin), member 1	1.2
DSCAML1	57453	Down syndrome cell adhesion molecule like 1	1.2
PTPRR	5801	protein tyrosine phosphatase, receptor type, R	1.2
RHOU	58480	ras homolog gene family, member U	1.2
RARA	5914	retinoic acid receptor, alpha	1.2
PLEKHF1	79156	pleckstrin homology domain containing, family F (with FYVE domain) member 1	1.2
CRB1	23418	crumbs homolog 1 (Drosophila)	1.2
ACOX1	51	acyl-Coenzyme A oxidase 1, palmitoyl	1.2
CGREF1	10669	cell growth regulator with EF-hand domain 1	1.2
CLEC4C	170482	C-type lectin domain family 4, member C	1.2
EPN2	22905	epsin 2	1.2
RAB14	51552	RAB14, member RAS oncogene family	1.2
SLC18A2	6571	solute carrier family 18 (vesicular monoamine), member 2	1.2
PTGES	9536	prostaglandin E synthase	1.2
CDC42EP5	148170	CDC42 effector protein (Rho GTPase binding) 5	1.2
GAS6	2621	growth arrest-specific 6	1.2
ITGA3	3675	integrin, alpha 3 (antigen CD49C, alpha 3 subunit of VLA-3 receptor)	1.2
PPP2R2C	5522	protein phosphatase 2 (formerly 2A), regulatory subunit B (PR 52), gamma isoform	1.2
CENPJ	55835	centromere protein J	1.2
SCEL	8796	sciellin	1.2
FMNL3	91010	formin-like 3	1.2

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RAPGEF2	9693	Rap guanine nucleotide exchange factor (GEF) 2	1.2
PKD1L2	114780	polycystic kidney disease 1-like 2	1.2
ADD3	120	adducin 3 (gamma)	1.2
HSPB6	126393	heat shock protein, alpha-crystallin-related, B6	1.2
TTBK2	146057	tau tubulin kinase 2	1.2
FPR1	2357	formyl peptide receptor 1	1.2
HRBL	3268	HIV-1 Rev binding protein-like	1.2
TAF7L	54457	TAF7-like RNA polymerase II, TATA box binding protein (TBP)-associated factor, 50kDa	1.2
SP100	6672	SP100 nuclear antigen	1.2
SDC3	9672	syndecan 3 (N-syndecan)	1.2
CDKN2B	1030	cyclin-dependent kinase inhibitor 2B (p15, inhibits CDK4)	1.2
TRIM31	11074	tripartite motif-containing 31	1.2
SULF1	23213	sulfatase 1	1.2
KISS1	3814	KiSS-1 metastasis-suppressor	1.2
RAG1	5896	recombination activating gene 1	1.2
PCGF2	7703	polycomb group ring finger 2	1.2
LDOC1	23641	leucine zipper, down-regulated in cancer 1	1.2
SYNJ1	8867	synaptojanin 1	1.2
CYP2E1	1571	cytochrome P450, family 2, subfamily E, polypeptide 1	1.2
RBJ	51277	Ras-associated protein Rap1	1.2
ZAN	7455	zonadhesin	1.2
CA9	768	carbonic anhydrase IX	1.2
CASR	846	calcium-sensing receptor (hypocalciuric hypercalcemia 1, severe neonatal hyperparathyroidism)	1.2
TMEM25	84866	transmembrane protein 25	1.2
ABCC3	8714	ATP-binding cassette, sub-family C (CFTR/MRP), member 3	1.2
MRCL3	10627	myosin regulatory light chain MRCL3	1.2
CAPN12	147968	calpain 12	1.2
SMAF1	149685	small adipocyte factor 1	1.2
ABCA2	20	ATP-binding cassette, sub-family A (ABC1), member 2	1.2
FBN2	2201	fibrillin 2 (congenital contractural arachnodactyly)	1.2
HADHSC	3033	L-3-hydroxyacyl-Coenzyme A dehydrogenase, short chain	1.2
SMAD3	4088	SMAD, mothers against DPP homolog 3 (Drosophila)	1.2
C9orf58	83543	chromosome 9 open reading frame 58	1.2
CAT	847	catalase	1.2
SLC27A1	376497	solute carrier family 27 (fatty acid transporter), member 1	1.2
CLU	1191	clusterin	1.2
CRHR2	1395	corticotropin releasing hormone receptor 2	1.2



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AP1G1	164	adaptor-related protein complex 1, gamma 1 subunit	1.2
DNASE1L3	1776	deoxyribonuclease I-like 3	1.2
GNS	2799	glucosamine (N-acetyl)-6-sulfatase (Sanfilippo disease IIID)	1.2
BDKRB2	624	bradykinin receptor B2	1.2
FLJ23588	64800	CAP-binding protein complex interacting protein 1	1.2
KCNB2	9312	potassium voltage-gated channel, Shab-related subfamily, member 2	1.2
S100Z	170591	S100 calcium binding protein, zeta	1.2
DKK1	22943	dickkopf homolog 1 ( <i>Xenopus laevis</i> )	1.2
HMGCS2	3158	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 2 (mitochondrial)	1.2
CADPS	8618	Ca <sup>2+</sup> -dependent secretion activator	1.2
CHRM5	1133	cholinergic receptor, muscarinic 5	1.2
IGF2	3481	insulin-like growth factor 2 (somatomedin A)	1.2
KCND3	3752	potassium voltage-gated channel, Shal-related subfamily, member 3	1.2
ADAMTS1	81794	ADAM metalloproteinase with thrombospondin type 1 motif, 10	1.2
RUNX1	861	runt-related transcription factor 1 (acute myeloid leukemia 1; aml1 oncogene)	1.2
YAF2	10138	YY1 associated factor 2	1.2
GRAP	10750	GRB2-related adaptor protein	1.2
MR1	3140	major histocompatibility complex, class I-related	1.2
MTHFR	4524	5,10-methylenetetrahydrofolate reductase (NADPH)	1.2
CDC42SE	56882	CDC42 small effector 1	1.2
STIM2	57620	stromal interaction molecule 2	1.2
RTN2	6253	reticulon 2	1.2
TNFRSF10	8794	tumor necrosis factor receptor superfamily, member 10c, decoy without an intracellular domain	1.2
WISP1	8840	WNT1 inducible signaling pathway protein 1	1.2
TRIM3	10612	tripartite motif-containing 3	1.2
CRHR1	1394	corticotropin releasing hormone receptor 1	1.2
C10orf137	26098	chromosome 10 open reading frame 137	1.2
CDR2L	30850	cerebellar degeneration-related protein 2-like	1.2
PAK1	5058	p21/Cdc42/Rac1-activated kinase 1 (STE20 homolog, yeast)	1.2
CXCL12	6387	chemokine (C-X-C motif) ligand 12 (stromal cell-derived factor 1)	1.2
FCRL4	83417	Fc receptor-like 4	1.2
TP53I11	9537	tumor protein p53 inducible protein 11	1.2
FRS3	10817	fibroblast growth factor receptor substrate 3	1.2
CHRNA4	1137	cholinergic receptor, nicotinic, alpha 4	1.2
PITX3	5309	paired-like homeodomain transcription factor 3	1.2
PPFIBP1	8496	PTPRF interacting protein, binding protein 1 (liprin beta 1)	1.2
CFH	3075	complement factor H	1.2



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APLP2	334	amyloid beta (A4) precursor-like protein 2	1.2
MYH8	4626	myosin, heavy polypeptide 8, skeletal muscle, perinatal	1.2
ATP2A3	489	ATPase, Ca <sup>++</sup> transporting, ubiquitous	1.2
ANTXR1	84168	anthrax toxin receptor 1	1.2
DCHS1	8642	dachsous 1 (Drosophila)	1.2
EDNRB	1910	endothelin receptor type B	1.2
NRF1	4899	nuclear respiratory factor 1	1.2
PRRX1	5396	paired related homeobox 1	1.2
LIPF	8513	lipase, gastric	1.2
SPATA2	9825	spermatogenesis associated 2	1.2
FAM107A	11170	family with sequence similarity 107, member A	1.2
AFG3L1	172	AFG3 ATPase family gene 3-like 1 (S. cerevisiae)	1.2
SLC6A2	6530	solute carrier family 6 (neurotransmitter transporter, noradrenalin), member 2	1.2
TRPC1	7220	transient receptor potential cation channel, subfamily C, member 1	1.2
ELF5	2001	E74-like factor 5 (ets domain transcription factor)	1.2
ARHGEF1	22899	Rho guanine nucleotide exchange factor (GEF) 15	1.2
PYCARD	29108	PYD and CARD domain containing	1.2
UNC13C	440279	unc-13 homolog C (C. elegans)	1.2
UBE2Q1	55585	ubiquitin-conjugating enzyme E2Q (putative) 1	1.2
CX36	57369	connexin-36	1.2
SEMA6A	57556	sema domain, transmembrane domain (TM), and cytoplasmic domain, (semaphorin) 6A	1.2
IL12RB1	3594	interleukin 12 receptor, beta 1	1.2
KIF22	3835	kinesin family member 22	1.2
BBS2	583	Bardet-Biedl syndrome 2	1.2
LATS1	9113	LATS, large tumor suppressor, homolog 1 (Drosophila)	1.2
EDG2	1902	endothelial differentiation, lysophosphatidic acid G-protein-coupled receptor, 2	1.2
FUT7	2529	fucosyltransferase 7 (alpha (1,3) fucosyltransferase)	1.2
PDLIM3	27295	PDZ and LIM domain 3	1.2
PCM1	5108	pericentriolar material 1	1.2
PDK2	5164	pyruvate dehydrogenase kinase, isozyme 2	1.2
POU6F1	5463	POU domain, class 6, transcription factor 1	1.2
ST14	6768	suppression of tumorigenicity 14 (colon carcinoma)	1.2
DSG2	1829	desmoglein 2	1.2
HRG	3273	histidine-rich glycoprotein	1.2
AR	367	androgen receptor (dihydrotestosterone receptor; testicular feminization; spinal and bulbar muscular atrophy; Ke	1.2
ZNF336	64412	zinc finger protein 336	1.2
CYP1A2	1544	cytochrome P450, family 1, subfamily A, polypeptide 2	1.2

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ZNF44	51710	zinc finger protein 44	1.2
CDH6	1004	cadherin 6, type 2, K-cadherin (fetal kidney)	1.2
CNTROB	116840	centrobin, centrosomal BRCA2 interacting protein	1.2
TRAK1	22906	trafficking protein, kinesin binding 1	1.2
SURF5	6837	surfeit 5	1.2
BCL11B	64919	B-cell CLL/lymphoma 11B (zinc finger protein)	1.2
TIGD7	91151	tigger transposable element derived 7	1.2
HEYL	26508	hairy/enhancer-of-split related with YRPW motif-like	1.2
KPNA5	3841	karyopherin alpha 5 (importin alpha 6)	1.2
PHTF2	57157	putative homeodomain transcription factor 2	1.2
ZNF79	7633	zinc finger protein 79	1.2
RTP1	132112	receptor transporter protein 1	1.2
GPR161	23432	G protein-coupled receptor 161	1.2
PRKRIP1	79706	PRKR interacting protein 1 (IL11 inducible)	1.2
SPSB1	80176	splA/ryanodine receptor domain and SOCS box containing 1	1.2
MTMR3	8897	myotubularin related protein 3	1.2
ECE2	9718	endothelin converting enzyme 2	1.2
DNAL11	7802	dynein, axonemal, light intermediate polypeptide 1	1.2
NUP214	8021	nucleoporin 214kDa	1.2
NLGN4Y	22829	neuroligin 4, Y-linked	1.2
KIAA1008	22894	KIAA1008	1.2
LSS	4047	lanosterol synthase (2,3-oxidosqualene-lanosterol cyclase)	1.2
LILRB3	11025	leukocyte immunoglobulin-like receptor, subfamily B (with TM and ITIM domains), member 3	1.2
SRR	63826	serine racemase	1.2
MXD1	4084	MAX dimerization protein 1	1.2
SLC22A18	5002	solute carrier family 22 (organic cation transporter), member 18	1.2
CFB	629	complement factor B	1.2
CDAN1	146059	congenital dyserythropoietic anemia, type I	1.2
ODF4	146852	outer dense fiber of sperm tails 4	1.2
PLD3	23646	phospholipase D family, member 3	1.2
KCNJ1	3758	potassium inwardly-rectifying channel, subfamily J, member 1	1.2
SPATA6	54558	spermatogenesis associated 6	1.2
RGS11	8786	regulator of G-protein signalling 11	1.2
TMEFF2	23671	transmembrane protein with EGF-like and two follistatin-like domains 2	1.2
CEP63	80254	centrosomal protein 63kDa	1.2
SNX26	115703	sorting nexin 26	1.2
MLANA	2315	melan-A	1.2

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CD300LF	146722	CD300 molecule-like family member f	1.2
MYT1L	23040	myelin transcription factor 1-like	1.2
SH2D1A	4068	SH2 domain protein 1A, Duncan's disease (lymphoproliferative syndrome)	1.2
TNFRSF10	8793	tumor necrosis factor receptor superfamily, member 10d, decoy with truncated death domain	1.2
CAPN9	10753	calpain 9	1.2
MDFI	4188	MyoD family inhibitor	1.2
HRASLS	57110	HRAS-like suppressor	1.2
ADAMTS2	9509	ADAM metalloproteinase with thrombospondin type 1 motif, 2	1.2
LRP5	4041	low density lipoprotein receptor-related protein 5	1.2
MAP1A	4130	microtubule-associated protein 1A	1.2
SMUG1	23583	single-strand-selective monofunctional uracil-DNA glycosylase 1	1.2
DST	667	dystonin	1.2
SLC25A20	788	solute carrier family 25 (carnitine/acylcarnitine translocase), member 20	1.2
GKAP1	80318	G kinase anchoring protein 1	1.2
GPRC5B	51704	G protein-coupled receptor, family C, group 5, member B	1.2
MTA2	9219	metastasis associated 1 family, member 2	1.2
TCHH	7062	trichohyalin	1.2
MED8	112950	mediator of RNA polymerase II transcription, subunit 8 homolog ( <i>S. cerevisiae</i> )	1.2
DCLRE1B	64858	DNA cross-link repair 1B (PSO2 homolog, <i>S. cerevisiae</i> )	1.2
SLC7A9	11136	solute carrier family 7 (cationic amino acid transporter, y+ system), member 9	1.2
EPB41L2	2037	erythrocyte membrane protein band 4.1-like 2	1.2
PKD1	5310	polycystic kidney disease 1 (autosomal dominant)	1.2
RCBTB1	55213	regulator of chromosome condensation (RCC1) and BTB (POZ) domain containing protein 1	1.2
HMG20B	10362	high-mobility group 20B	1.2
PTK2B	2185	PTK2B protein tyrosine kinase 2 beta	1.2
CPNE8	144402	copine VIII	1.2
MGST1	4257	microsomal glutathione S-transferase 1	1.2
BMPR2	659	bone morphogenetic protein receptor, type II (serine/threonine kinase)	1.2
DLX1	1745	distal-less homeobox 1	1.2
SAR1A	56681	SAR1 gene homolog A ( <i>S. cerevisiae</i> )	-1.2
NONO	4841	non-POU domain containing, octamer-binding	-1.2
PRPF40A	55660	PRP40 pre-mRNA processing factor 40 homolog A (yeast)	-1.2
PUM1	9698	pumilio homolog 1 ( <i>Drosophila</i> )	-1.2
CDK4	1019	cyclin-dependent kinase 4	-1.2
SLC19A1	6573	solute carrier family 19 (folate transporter), member 1	-1.2
STK4	6789	serine/threonine kinase 4	-1.2
ARPP-19	10776	cyclic AMP phosphoprotein, 19 kD	-1.2

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DAZAP1	26528	DAZ associated protein 1	-1.2
STAU1	6780	staufer, RNA binding protein, homolog 1 (Drosophila)	-1.2
SYNCRIP	10492	synaptotagmin binding, cytoplasmic RNA interacting protein	-1.2
DNAJA3	9093	DnaJ (Hsp40) homolog, subfamily A, member 3	-1.2
BAZ1A	11177	bromodomain adjacent to zinc finger domain, 1A	-1.2
NAT13	80218	N-acetyltransferase 13	-1.2
PRPF4B	8899	PRP4 pre-mRNA processing factor 4 homolog B (yeast)	-1.2
SAR1B	51128	SAR1 gene homolog B (S. cerevisiae)	-1.2
WDR12	55759	WD repeat domain 12	-1.2
EIF2S1	1965	eukaryotic translation initiation factor 2, subunit 1 alpha, 35kDa	-1.2
ILF3	3609	interleukin enhancer binding factor 3, 90kDa	-1.2
OPRS1	10280	opioid receptor, sigma 1	-1.2
FBXO38	81545	F-box protein 38	-1.2
HSPA9B	3313	heat shock 70kDa protein 9B (mortalin-2)	-1.2
ZCCHC8	55596	zinc finger, CCHC domain containing 8	-1.2
TM9SF3	56889	transmembrane 9 superfamily member 3	-1.2
ZMYND19	116225	zinc finger, MYND-type containing 19	-1.2
HIP2	3093	huntingtin interacting protein 2	-1.2
PSMA1	5682	proteasome (prosome, macropain) subunit, alpha type, 1	-1.2
SFRS2	6427	splicing factor, arginine/serine-rich 2	-1.2
CUGBP1	10658	CUG triplet repeat, RNA binding protein 1	-1.2
TNPO2	30000	transportin 2 (importin 3, karyopherin beta 2b)	-1.2
ZNF24	7572	zinc finger protein 24	-1.2
PEX3	8504	peroxisomal biogenesis factor 3	-1.2
CRI1	23741	CREBBP/EP300 inhibitor 1	-1.2
RBM5	10181	RNA binding motif protein 5	-1.2
FUSIP1	10772	FUS interacting protein (serine/arginine-rich) 1	-1.2
RAB18	22931	RAB18, member RAS oncogene family	-1.2
DAP3	7818	death associated protein 3	-1.2
SNX4	8723	sorting nexin 4	-1.2
COX4NB	10328	COX4 neighbor	-1.2
CHD1	1105	chromodomain helicase DNA binding protein 1	-1.2
NAG8	27099	nasopharyngeal carcinoma associated gene protein-8	-1.2
PEX26	55670	peroxisome biogenesis factor 26	-1.2
TCEB3	6924	transcription elongation factor B (SIII), polypeptide 3 (110kDa, elongin A)	-1.2
LRRFIP1	9208	leucine rich repeat (in FLII) interacting protein 1	-1.2
TSR1	55720	TSR1, 20S rRNA accumulation, homolog (S. cerevisiae)	-1.2

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NDUFA6	4700	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 6, 14kDa	-1.2
HOMER1	9456	homer homolog 1 (Drosophila)	-1.2
HBXIP	10542	hepatitis B virus x interacting protein	-1.2
NDFIP2	54602	Nedd4 family interacting protein 2	-1.2
PSMD4	5710	proteasome (prosome, macropain) 26S subunit, non-ATPase, 4	-1.2
CUL3	8452	cullin 3	-1.2
HNRPDL	9987	heterogeneous nuclear ribonucleoprotein D-like	-1.2
PPP1CC	5501	protein phosphatase 1, catalytic subunit, gamma isoform	-1.2
LASS6	253782	LAG1 longevity assurance homolog 6 (S. cerevisiae)	-1.2
PPM1B	5495	protein phosphatase 1B (formerly 2C), magnesium-dependent, beta isoform	-1.2
JARID1A	5927	Jumonji, AT rich interactive domain 1A (RBBP2-like)	-1.2
SRP46	10929	Splicing factor, arginine/serine-rich, 46kD	-1.2
FKBP5	2289	FK506 binding protein 5	-1.2
CHMP2B	25978	chromatin modifying protein 2B	-1.2
SH3GLB1	51100	SH3-domain GRB2-like endophilin B1	-1.2
U2AF2	11338	U2 small nuclear RNA auxiliary factor 2	-1.2
ODC1	4953	ornithine decarboxylase 1	-1.2
GFM1	85476	G elongation factor, mitochondrial 1	-1.2
PCSK7	9159	proprotein convertase subtilisin/kexin type 7	-1.2
SERINC1	57515	serine incorporator 1	-1.2
NCOA6IP	96764	nuclear receptor coactivator 6 interacting protein	-1.2
MRPL10	124995	mitochondrial ribosomal protein L10	-1.2
ARF1	375	ADP-ribosylation factor 1	-1.2
SLC7A6	9057	solute carrier family 7 (cationic amino acid transporter, y+ system), member 6	-1.2
CSTF2	1478	cleavage stimulation factor, 3' pre-RNA, subunit 2, 64kDa	-1.2
DHX15	1665	DEAH (Asp-Glu-Ala-His) box polypeptide 15	-1.2
TNFAIP8	25816	tumor necrosis factor, alpha-induced protein 8	-1.2
YRDC	79693	yrdC domain containing (E. coli)	-1.2
NAT5	51126	N-acetyltransferase 5	-1.2
JTB	10899	jumping translocation breakpoint	-1.2
TRNT1	51095	tRNA nucleotidyl transferase, CCA-adding, 1	-1.2
ETF1	2107	eukaryotic translation termination factor 1	-1.2
SYF2	25949	SYF2 homolog, RNA splicing factor (S. cerevisiae)	-1.2
XTP3TPA	79077	XTP3-transactivated protein A	-1.2
WDR26	80232	WD repeat domain 26	-1.2
CEP170	9859	centrosomal protein 170kDa	-1.2
ZNF292	23036	zinc finger protein 292	-1.2

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ATP6V1B2	526	ATPase, H <sup>+</sup> transporting, lysosomal 56/58kDa, V1 subunit B2	-1.2
EIF3S9	8662	eukaryotic translation initiation factor 3, subunit 9 eta, 116kDa	-1.2
PWP1	11137	PWP1 homolog ( <i>S. cerevisiae</i> )	-1.2
FOXP1	27086	forkhead box P1	-1.2
SMARCC1	6599	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily c, member 1	-1.2
EWSR1	2130	Ewing sarcoma breakpoint region 1	-1.2
MBNL1	4154	muscleblind-like ( <i>Drosophila</i> )	-1.2
PDE7A	5150	phosphodiesterase 7A	-1.2
POLR1E	64425	polymerase (RNA) I polypeptide E, 53kDa	-1.2
RB1CC1	9821	RB1-inducible coiled-coil 1	-1.2
MED6	10001	mediator of RNA polymerase II transcription, subunit 6 homolog ( <i>S. cerevisiae</i> )	-1.2
NUPL2	11097	nucleoporin like 2	-1.2
NIN	51199	ninein (GSK3B interacting protein)	-1.2
HINT1	3094	histidine triad nucleotide binding protein 1	-1.2
SFRS12	140890	splicing factor, arginine/serine-rich 12	-1.2
DCTD	1635	dCMP deaminase	-1.2
PELI1	57162	pellino homolog 1 ( <i>Drosophila</i> )	-1.2
SMARCA4	6597	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily a, member 4	-1.2
EPN4	9685	epsin 4	-1.2
LIN7C	55327	lin-7 homolog C ( <i>C. elegans</i> )	-1.2
CSPG6	9126	chondroitin sulfate proteoglycan 6 (bamacan)	-1.2
HMGN4	10473	high mobility group nucleosomal binding domain 4	-1.2
MKLN1	4289	muskelin 1, intracellular mediator containing kelch motifs	-1.2
CRNKL1	51340	Crn, crooked neck-like 1 ( <i>Drosophila</i> )	-1.2
PMAIP1	5366	phorbol-12-myristate-13-acetate-induced protein 1	-1.2
TARS	6897	threonyl-tRNA synthetase	-1.2
ADPGK	83440	ADP-dependent glucokinase	-1.2
CCDC84	338657	coiled-coil domain containing 84	-1.2
NPC1	4864	Niemann-Pick disease, type C1	-1.2
PTP4A1	7803	protein tyrosine phosphatase type IVA, member 1	-1.2
CUL5	8065	cullin 5	-1.2
TMEM97	27346	transmembrane protein 97	-1.2
MLR2	84458	ligand-dependent corepressor	-1.2
MAP4K3	8491	mitogen-activated protein kinase kinase kinase kinase 3	-1.2
ACLY	47	ATP citrate lyase	-1.2
COX4I1	1327	cytochrome c oxidase subunit IV isoform 1	-1.2
CREBL2	1389	cAMP responsive element binding protein-like 2	-1.2

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PLDN	26258	pallidin homolog (mouse)	-1.2
STYXL1	51657	serine/threonine/tyrosine interacting-like 1	-1.2
WHSC1L1	54904	Wolf-Hirschhorn syndrome candidate 1-like 1	-1.2
TAX1BP1	8887	Tax1 (human T-cell leukemia virus type I) binding protein 1	-1.2
RAB7	7879	RAB7, member RAS oncogene family	-1.2
DDX48	9775	DEAD (Asp-Glu-Ala-Asp) box polypeptide 48	-1.2
SRA1	10011	steroid receptor RNA activator 1	-1.2
IPO7	10527	importin 7	-1.2
LRRC8D	55144	leucine rich repeat containing 8 family, member D	-1.2
EIF2S2	8894	eukaryotic translation initiation factor 2, subunit 2 beta, 38kDa	-1.2
MAGEH1	28986	melanoma antigen family H, 1	-1.2
CDK6	1021	cyclin-dependent kinase 6	-1.2
ATXN10	25814	ataxin 10	-1.2
ERCC1	2067	excision repair cross-complementing rodent repair deficiency, complementation group 1 (includes overlapping ar	-1.2
C5orf5	51306	chromosome 5 open reading frame 5	-1.2
RBMS1	5937	RNA binding motif, single stranded interacting protein 1	-1.2
SET	6418	SET translocation (myeloid leukemia-associated)	-1.2
SON	6651	SON DNA binding protein	-1.2
ZMPSTE24	10269	zinc metallopeptidase (STE24 homolog, yeast)	-1.2
GLUD1	2746	glutamate dehydrogenase 1	-1.2
KRT10	3858	keratin 10 (epidermolytic hyperkeratosis; keratosis palmaris et plantaris)	-1.2
BAG1	573	BCL2-associated athanogene	-1.2
DCLRE1C	64421	DNA cross-link repair 1C (PSO2 homolog, <i>S. cerevisiae</i> )	-1.2
FXR1	8087	fragile X mental retardation, autosomal homolog 1	-1.2
MED4	29079	mediator of RNA polymerase II transcription, subunit 4 homolog ( <i>S. cerevisiae</i> )	-1.2
SLC44A2	57153	solute carrier family 44, member 2	-1.2
SNX1	6642	sorting nexin 1	-1.2
MCM3AP	8888	MCM3 minichromosome maintenance deficient 3 ( <i>S. cerevisiae</i> ) associated protein	-1.2
SPAG9	9043	sperm associated antigen 9	-1.2
DRG1	4733	developmentally regulated GTP binding protein 1	-1.2
LRPPRC	10128	leucine-rich PPR-motif containing	-1.2
DUSP6	1848	dual specificity phosphatase 6	-1.2
RAB11FIP1	22841	RAB11 family interacting protein 2 (class I)	-1.2
MTR	4548	5-methyltetrahydrofolate-homocysteine methyltransferase	-1.2
TMEM30A	55754	transmembrane protein 30A	-1.2
CARS	833	cysteinyl-tRNA synthetase	-1.2
DNM1L	10059	dynamamin 1-like	-1.2



Table\_S2

DR1	1810	down-regulator of transcription 1, TBP-binding (negative cofactor 2)	-1.2
ARID2	196528	AT rich interactive domain 2 (ARID, RFX-like)	-1.2
CD2AP	23607	CD2-associated protein	-1.2
TAF9	6880	TAF9 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 32kDa	-1.2
CUL4A	8451	cullin 4A	-1.2
RFC1	5981	replication factor C (activator 1) 1, 145kDa	-1.2
SLC12A2	6558	solute carrier family 12 (sodium/potassium/chloride transporters), member 2	-1.2
RIOK1	83732	RIO kinase 1 (yeast)	-1.2
HSPC117	51493	hypothetical protein HSPC117	-1.2
BRWD2	55717	bromodomain and WD repeat domain containing 2	-1.2
TP53BP2	7159	tumor protein p53 binding protein, 2	-1.2
UTP20	27340	UTP20, small subunit (SSU) processome component, homolog (yeast)	-1.2
ZNF295	49854	zinc finger protein 295	-1.2
SLC38A1	81539	solute carrier family 38, member 1	-1.2
EPRS	2058	glutamyl-prolyl-tRNA synthetase	-1.2
MLL3	58508	myeloid/lymphoid or mixed-lineage leukemia 3	-1.2
H2AFY	9555	H2A histone family, member Y	-1.2
SAP18	10284	Sin3A-associated protein, 18kDa	-1.2
RY1	11017	putative nucleic acid binding protein RY-1	-1.2
KRR1	11103	KRR1, small subunit (SSU) processome component, homolog (yeast)	-1.2
ANKRD17	26057	ankyrin repeat domain 17	-1.2
RHOF	54509	ras homolog gene family, member F (in filopodia)	-1.2
AGPAT5	55326	1-acylglycerol-3-phosphate O-acyltransferase 5 (lysophosphatidic acid acyltransferase, epsilon)	-1.2
CHD7	55636	chromodomain helicase DNA binding protein 7	-1.2
EP400	57634	E1A binding protein p400	-1.2
DICER1	23405	Dicer1, Dcr-1 homolog (Drosophila)	-1.2
GSPT1	2935	G1 to S phase transition 1	-1.2
SAPS3	55291	SAPS domain family, member 3	-1.2
SKIV2L2	23517	superkiller viralicidic activity 2-like 2 (S. cerevisiae)	-1.2
NOL7	51406	nucleolar protein 7, 27kDa	-1.2
UBAP2L	9898	ubiquitin associated protein 2-like	-1.2
MYO6	4646	myosin VI	-1.3
ETNK1	55500	ethanolamine kinase 1	-1.3
TOR3A	64222	torsin family 3, member A	-1.3
TRPM7	54822	transient receptor potential cation channel, subfamily M, member 7	-1.3
ADIPOR2	79602	adiponectin receptor 2	-1.3
CUZD1	50624	CUB and zona pellucida-like domains 1	-1.3



Table\_S2

AK2	204	adenylate kinase 2	-1.3
ARL5A	26225	ADP-ribosylation factor-like 5A	-1.3
MARS	4141	methionine-tRNA synthetase	-1.3
DDEF1	50807	development and differentiation enhancing factor 1	-1.3
EIF5B	9669	eukaryotic translation initiation factor 5B	-1.3
NUDC	10726	nuclear distribution gene C homolog (A. nidulans)	-1.3
ATR	545	ataxia telangiectasia and Rad3 related	-1.3
BCL2A1	597	BCL2-related protein A1	-1.3
FOXK1	221937	forkhead box K1	-1.3
OPA1	4976	optic atrophy 1 (autosomal dominant)	-1.3
RBBP6	5930	retinoblastoma binding protein 6	-1.3
AEBP2	121536	AE binding protein 2	-1.3
IL6	3569	interleukin 6 (interferon, beta 2)	-1.3
TXNDC14	51075	thioredoxin domain containing 14	-1.3
GCN1L1	10985	GCN1 general control of amino-acid synthesis 1-like 1 (yeast)	-1.3
OXCT1	5019	3-oxoacid CoA transferase 1	-1.3
PRKDC	5591	protein kinase, DNA-activated, catalytic polypeptide	-1.3
REXO2	25996	REX2, RNA exonuclease 2 homolog (S. cerevisiae)	-1.3
PURB	5814	purine-rich element binding protein B	-1.3
SHMT2	6472	serine hydroxymethyltransferase 2 (mitochondrial)	-1.3
DEK	7913	DEK oncogene (DNA binding)	-1.3
MADD	8567	MAP-kinase activating death domain	-1.3
PCBP2	5094	poly(rC) binding protein 2	-1.3
BNIP2	663	BCL2/adenovirus E1B 19kDa interacting protein 2	-1.3
C1orf24	116496	chromosome 1 open reading frame 24	-1.3
KTN1	3895	kinectin 1 (kinesin receptor)	-1.3
ABLIM1	3983	actin binding LIM protein 1	-1.3
NSMAF	8439	neutral sphingomyelinase (N-SMase) activation associated factor	-1.3
CD58	965	CD58 molecule	-1.3
KIF1B	23095	kinesin family member 1B	-1.3
CSDE1	7812	cold shock domain containing E1, RNA-binding	-1.3
VGLL4	9686	vestigial like 4 (Drosophila)	-1.3
NETO2	81831	neuropilin (NRP) and tolloid (TLL)-like 2	-1.3
BTA1	9044	BTA1 RNA polymerase II, B-TFIID transcription factor-associated, 170kDa (Mot1 homolog, S. cerevisiae)	-1.3
GLUL	2752	glutamate-ammonia ligase (glutamine synthetase)	-1.3
UBQLN2	29978	ubiquilin 2	-1.3
PRNP	5621	prion protein (p27-30) (Creutzfeldt-Jakob disease, Gerstmann-Strausler-Scheinker syndrome, fatal familial insomnia)	-1.3

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UTY	7404	ubiquitously transcribed tetratricopeptide repeat gene, Y-linked	-1.3
PNPT1	87178	polyribonucleotide nucleotidyltransferase 1	-1.3
GOSR1	9527	golgi SNAP receptor complex member 1	-1.3
EIF2C2	27161	eukaryotic translation initiation factor 2C, 2	-1.3
ATXN1	6310	ataxin 1	-1.3
TAF1A	9015	TATA box binding protein (TBP)-associated factor, RNA polymerase I, A, 48kDa	-1.3
TPRKB	51002	TP53RK binding protein	-1.3
PPARBP	5469	PPAR binding protein	-1.3
RAB8B	51762	RAB8B, member RAS oncogene family	-1.3
MYCBP2	23077	MYC binding protein 2	-1.3
IVD	3712	isovaleryl Coenzyme A dehydrogenase	-1.3
ATXN7	6314	ataxin 7	-1.3
SPTLC1	10558	serine palmitoyltransferase, long chain base subunit 1	-1.3
TMOD3	29766	tropomodulin 3 (ubiquitous)	-1.3
LNPEP	4012	leucyl/cystinyl aminopeptidase	-1.3
PNMA1	9240	paraneoplastic antigen MA1	-1.3
NPEPPS	9520	aminopeptidase puromycin sensitive	-1.3
ATRX	546	alpha thalassemia/mental retardation syndrome X-linked (RAD54 homolog, <i>S. cerevisiae</i> )	-1.3
GREM1	26585	gremlin 1, cysteine knot superfamily, homolog ( <i>Xenopus laevis</i> )	-1.3
ACP1	52	acid phosphatase 1, soluble	-1.3
TSEN2	80746	tRNA splicing endonuclease 2 homolog ( <i>S. cerevisiae</i> )	-1.3
LRRC8C	84230	leucine rich repeat containing 8 family, member C	-1.3
AMID	84883	apoptosis-inducing factor (AIF)-like mitochondrion-associated inducer of death	-1.3
PPFIA1	8500	protein tyrosine phosphatase, receptor type, f polypeptide (PTPRF), interacting protein (liprin), alpha 1	-1.3
CD55	1604	CD55 molecule, decay accelerating factor for complement (Cromer blood group)	-1.3
ASH1L	55870	ash1 (absent, small, or homeotic)-like ( <i>Drosophila</i> )	-1.3
DSTN	11034	destrin (actin depolymerizing factor)	-1.3
SLC30A7	148867	solute carrier family 30 (zinc transporter), member 7	-1.3
CHRAC1	54108	chromatin accessibility complex 1	-1.3
POLR2B	5431	polymerase (RNA) II (DNA directed) polypeptide B, 140kDa	-1.3
UBE3A	7337	ubiquitin protein ligase E3A (human papilloma virus E6-associated protein, Angelman syndrome)	-1.3
CEP110	11064	centrosomal protein 110kDa	-1.3
JMJD1C	221037	jumonji domain containing 1C	-1.3
STAT6	6778	signal transducer and activator of transcription 6, interleukin-4 induced	-1.3
AHSA1	10598	AHA1, activator of heat shock 90kDa protein ATPase homolog 1 (yeast)	-1.3
MMD	23531	monocyte to macrophage differentiation-associated	-1.3
TRAPPC4	51399	trafficking protein particle complex 4	-1.3

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JMJD1B	51780	jumonji domain containing 1B	-1.3
C20orf24	55969	chromosome 20 open reading frame 24	-1.3
UBE2G2	7327	ubiquitin-conjugating enzyme E2G 2 (UBC7 homolog, yeast)	-1.3
IER3	8870	immediate early response 3	-1.3
C14orf2	9556	chromosome 14 open reading frame 2	-1.3
SUMF1	285362	sulfatase modifying factor 1	-1.3
ANXA7	310	annexin A7	-1.3
HELLS	3070	helicase, lymphoid-specific	-1.3
CD82	3732	CD82 molecule	-1.3
SLC7A1	6541	solute carrier family 7 (cationic amino acid transporter, y+ system), member 1	-1.3
SAMSN1	64092	SAM domain, SH3 domain and nuclear localisation signals, 1	-1.3
CCND3	896	cyclin D3	-1.3
ATP2B1	490	ATPase, Ca <sup>++</sup> transporting, plasma membrane 1	-1.3
SNX9	51429	sorting nexin 9	-1.3
VPS24	51652	vacuolar protein sorting 24 homolog (S. cerevisiae)	-1.3
ASNS	440	asparagine synthetase	-1.3
ADAM33	80332	ADAM metallopeptidase domain 33	-1.3
CD69	969	CD69 molecule	-1.3
CIRBP	1153	cold inducible RNA binding protein	-1.3
SRRM2	23524	serine/arginine repetitive matrix 2	-1.3
BCLAF1	9774	BCL2-associated transcription factor 1	-1.3
PSMC3	5702	proteasome (prosome, macropain) 26S subunit, ATPase, 3	-1.3
NOTCH2N	388677	Notch homolog 2 (Drosophila) N-terminal like	-1.3
NPAT	4863	nuclear protein, ataxia-telangiectasia locus	-1.3
MARCH6	10299	membrane-associated ring finger (C3HC4) 6	-1.3
COPS8	10920	COP9 constitutive photomorphogenic homolog subunit 8 (Arabidopsis)	-1.3
HIPK1	204851	homeodomain interacting protein kinase 1	-1.3
RAB6IP1	23258	RAB6 interacting protein 1	-1.3
GCLC	2729	glutamate-cysteine ligase, catalytic subunit	-1.3
RAD51L3	5892	RAD51-like 3 (S. cerevisiae)	-1.3
NADK	65220	NAD kinase	-1.3
ARPC5	10092	actin related protein 2/3 complex, subunit 5, 16kDa	-1.3
ANKRD11	29123	ankyrin repeat domain 11	-1.3
SMAD1	4086	SMAD, mothers against DPP homolog 1 (Drosophila)	-1.3
MAN2A1	4124	mannosidase, alpha, class 2A, member 1	-1.3
BECN1	8678	beclin 1 (coiled-coil, myosin-like BCL2 interacting protein)	-1.3
ADCY3	109	adenylate cyclase 3	-1.3

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SMAD5	4090	SMAD, mothers against DPP homolog 5 (Drosophila)	-1.3
TAF2	6873	TAF2 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 150kDa	-1.3
BRD3	8019	bromodomain containing 3	-1.3
PDCD7	10081	programmed cell death 7	-1.3
CUGBP2	10659	CUG triplet repeat, RNA binding protein 2	-1.3
EXOSC8	11340	exosome component 8	-1.3
ZNF367	195828	zinc finger protein 367	-1.3
SACS	26278	spastic ataxia of Charlevoix-Saguenay (sacsin)	-1.3
DYRK2	8445	dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 2	-1.3
FAM84B	157638	family with sequence similarity 84, member B	-1.3
ETS2	2114	v-ets erythroblastosis virus E26 oncogene homolog 2 (avian)	-1.3
TNRC6B	23112	trinucleotide repeat containing 6B	-1.3
RBBP8	5932	retinoblastoma binding protein 8	-1.3
C14orf11	55837	chromosome 14 open reading frame 11	-1.3
PTPRC	5788	protein tyrosine phosphatase, receptor type, C	-1.3
NOM1	64434	nucleolar protein with MIF4G domain 1	-1.3
ADK	132	adenosine kinase	-1.3
GALNT2	2590	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 2 (GalNAc-T2)	-1.3
TTC12	54970	tetratricopeptide repeat domain 12	-1.3
TRIO	7204	triple functional domain (PTPRF interacting)	-1.3
CD44	960	CD44 molecule (Indian blood group)	-1.3
TGOLN2	10618	trans-golgi network protein 2	-1.3
DGCR14	8220	DiGeorge syndrome critical region gene 14	-1.3
COPB	1315	coatamer protein complex, subunit beta	-1.3
ADSS	159	adenylosuccinate synthase	-1.3
PITPNB	23760	phosphatidylinositol transfer protein, beta	-1.3
PCAF	8850	p300/CBP-associated factor	-1.3
PARD3	56288	par-3 partitioning defective 3 homolog (C. elegans)	-1.3
RSN	6249	restin (Reed-Steinberg cell-expressed intermediate filament-associated protein)	-1.3
MTMR9	66036	myotubularin related protein 9	-1.3
STK24	8428	serine/threonine kinase 24 (STE20 homolog, yeast)	-1.3
PPIA	5478	peptidylprolyl isomerase A (cyclophilin A)	-1.3
SLAMF1	6504	signaling lymphocytic activation molecule family member 1	-1.3
PNN	5411	pinin, desmosome associated protein	-1.3
AHI1	54806	Abelson helper integration site 1	-1.3
CCAR1	55749	cell division cycle and apoptosis regulator 1	-1.3
HSPH1	10808	heat shock 105kDa/110kDa protein 1	-1.3

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RAB31	11031	RAB31, member RAS oncogene family	-1.3
SNX5	27131	sorting nexin 5	-1.3
HLA-B	3106	major histocompatibility complex, class I, B	-1.3
RAB11FIP	9727	RAB11 family interacting protein 3 (class II)	-1.3
IL18RAP	8807	interleukin 18 receptor accessory protein	-1.3
STOM	2040	stomatin	-1.3
CXCL11	6373	chemokine (C-X-C motif) ligand 11	-1.3
FVT1	2531	follicular lymphoma variant translocation 1	-1.3
PITRM1	10531	pitrilysin metalloproteinase 1	-1.3
REPEAT	473	arginine-glutamic acid dipeptide (RE) repeats	-1.3
PDHB	5162	pyruvate dehydrogenase (lipoamide) beta	-1.3
CBLB	868	Cas-Br-M (murine) ecotropic retroviral transforming sequence b	-1.3
JAK2	3717	Janus kinase 2 (a protein tyrosine kinase)	-1.3
BNIP3	664	BCL2/adenovirus E1B 19kDa interacting protein 3	-1.3
DYNC1H1	1778	dynein, cytoplasmic 1, heavy chain 1	-1.3
IFI16	3428	interferon, gamma-inducible protein 16	-1.3
DOCK10	55619	dedicator of cytokinesis 10	-1.3
PRKAR1A	5573	protein kinase, cAMP-dependent, regulatory, type I, alpha (tissue specific extinguisher 1)	-1.3
CLTA	1211	clathrin, light polypeptide (Lca)	-1.3
CTSC	1075	cathepsin C	-1.3
TOR1B	27348	torsin family 1, member B (torsin B)	-1.3
BACH1	571	BTB and CNC homology 1, basic leucine zipper transcription factor 1	-1.3
MYEF2	50804	myelin expression factor 2	-1.3
MAP1LC3B	81631	microtubule-associated protein 1 light chain 3 beta	-1.3
ITGAV	3685	integrin, alpha V (vitronectin receptor, alpha polypeptide, antigen CD51)	-1.3
KLF9	687	Kruppel-like factor 9	-1.3
CAMK2D	817	calcium/calmodulin-dependent protein kinase (CaM kinase) II delta	-1.3
KHDRBS1	10657	KH domain containing, RNA binding, signal transduction associated 1	-1.3
SPEN	23013	spen homolog, transcriptional regulator (Drosophila)	-1.3
VPS13B	157680	vacuolar protein sorting 13B (yeast)	-1.3
TIPRL	261726	TIP41, TOR signalling pathway regulator-like (S. cerevisiae)	-1.3
RB1	5925	retinoblastoma 1 (including osteosarcoma)	-1.3
CHSY1	22856	carbohydrate (chondroitin) synthase 1	-1.3
MGLL	11343	monoglyceride lipase	-1.3
CTLA4	1493	cytotoxic T-lymphocyte-associated protein 4	-1.3
TUBE1	51175	tubulin, epsilon 1	-1.3
IFT57	55081	intraflagellar transport 57 homolog (Chlamydomonas)	-1.3

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NIP7	51388	nuclear import 7 homolog ( <i>S. cerevisiae</i> )	-1.3
PFDN4	5203	prefoldin subunit 4	-1.3
MAPK1	5594	mitogen-activated protein kinase 1	-1.3
CD47	961	CD47 molecule	-1.3
PKD2	5311	polycystic kidney disease 2 (autosomal dominant)	-1.3
ERBB2IP	55914	erbb2 interacting protein	-1.3
OAT	4942	ornithine aminotransferase (gyrate atrophy)	-1.3
PHF11	51131	PHD finger protein 11	-1.3
ZNF37A	7587	zinc finger protein 37A	-1.3
CALM1	801	calmodulin 1 (phosphorylase kinase, delta)	-1.3
OGT	8473	O-linked N-acetylglucosamine (GlcNAc) transferase (UDP-N-acetylglucosamine:polypeptide-N-acetylglucosamin	-1.3
CD151	977	CD151 molecule (Raph blood group)	-1.3
DLEU1	10301	deleted in lymphocytic leukemia, 1	-1.3
TAF4B	6875	TAF4b RNA polymerase II, TATA box binding protein (TBP)-associated factor, 105kDa	-1.3
GLIS3	169792	GLIS family zinc finger 3	-1.3
ZFY	7544	zinc finger protein, Y-linked	-1.3
DDB2	1643	damage-specific DNA binding protein 2, 48kDa	-1.3
PTPRE	5791	protein tyrosine phosphatase, receptor type, E	-1.3
SEPT11	55752	septin 11	-1.3
ACTR2	10097	ARP2 actin-related protein 2 homolog (yeast)	-1.3
INPP5F	22876	inositol polyphosphate-5-phosphatase F	-1.3
TGFBR2	7048	transforming growth factor, beta receptor II (70/80kDa)	-1.3
PIGT	51604	phosphatidylinositol glycan, class T	-1.3
ZNF655	79027	zinc finger protein 655	-1.3
WDR61	80349	WD repeat domain 61	-1.3
MTRR	4552	5-methyltetrahydrofolate-homocysteine methyltransferase reductase	-1.3
NRIP1	8204	nuclear receptor interacting protein 1	-1.3
LARS	51520	leucyl-tRNA synthetase	-1.3
CNDP2	55748	CNDP dipeptidase 2 (metallopeptidase M20 family)	-1.3
AMIGO2	347902	adhesion molecule with Ig-like domain 2	-1.3
SMG1	23049	PI-3-kinase-related kinase SMG-1	-1.3
PARVB	29780	parvin, beta	-1.3
EPS15	2060	epidermal growth factor receptor pathway substrate 15	-1.3
STX12	23673	syntaxin 12	-1.3
PTPN11	5781	protein tyrosine phosphatase, non-receptor type 11 (Noonan syndrome 1)	-1.3
FMNL2	114793	formin-like 2	-1.3
NDUFS8	4728	NADH dehydrogenase (ubiquinone) Fe-S protein 8, 23kDa (NADH-coenzyme Q reductase)	-1.3

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SGK	6446	serum/glucocorticoid regulated kinase	-1.3
PITPNA	5306	phosphatidylinositol transfer protein, alpha	-1.3
COL18A1	80781	collagen, type XVIII, alpha 1	-1.3
IRS2	8660	insulin receptor substrate 2	-1.3
LPL	4023	lipoprotein lipase	-1.3
TBRG1	84897	transforming growth factor beta regulator 1	-1.3
PXMP3	5828	peroxisomal membrane protein 3, 35kDa (Zellweger syndrome)	-1.3
ABCD3	5825	ATP-binding cassette, sub-family D (ALD), member 3	-1.3
REV3L	5980	REV3-like, catalytic subunit of DNA polymerase zeta (yeast)	-1.3
ARID1A	8289	AT rich interactive domain 1A (SWI- like)	-1.3
EP300	2033	E1A binding protein p300	-1.3
MRPL2	51069	mitochondrial ribosomal protein L2	-1.4
PTBP1	5725	polypyrimidine tract binding protein 1	-1.4
SLC16A7	9194	solute carrier family 16 (monocarboxylic acid transporters), member 7	-1.4
EBNA1BP2	10969	EBNA1 binding protein 2	-1.4
HSPA14	51182	heat shock 70kDa protein 14	-1.4
SLC38A2	54407	solute carrier family 38, member 2	-1.4
CSDA	8531	cold shock domain protein A	-1.4
MAF	4094	v-maf musculoaponeurotic fibrosarcoma oncogene homolog (avian)	-1.4
AYTL2	79888	acyltransferase like 2	-1.4
TNFRSF2	27242	tumor necrosis factor receptor superfamily, member 21	-1.4
ZFP57	346171	zinc finger protein 57 homolog (mouse)	-1.4
GOLGA4	2803	golgi autoantigen, golgin subfamily a, 4	-1.4
PAM	5066	peptidylglycine alpha-amidating monooxygenase	-1.4
PRSS23	11098	protease, serine, 23	-1.4
ZAK	51776	sterile alpha motif and leucine zipper containing kinase AZK	-1.4
MALAT1	378938	metastasis associated lung adenocarcinoma transcript 1 (non-coding RNA)	-1.4
KCNK1	3775	potassium channel, subfamily K, member 1	-1.4
YEATS4	8089	YEATS domain containing 4	-1.4
TncRNA	283131	trophoblast-derived noncoding RNA	-1.4
COCH	1690	coagulation factor C homolog, cochlin (Limulus polyphemus)	-1.4
IL17A	3605	interleukin 17A	-1.4
C20orf6	51575	chromosome 20 open reading frame 6	-1.4
LRRC4	64101	leucine rich repeat containing 4	-1.4
CD40LG	959	CD40 ligand (TNF superfamily, member 5, hyper-IgM syndrome)	-1.4
PRDX4	10549	peroxiredoxin 4	-1.4
MLF1	4291	myeloid leukemia factor 1	-1.4



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FYN	2534	FYN oncogene related to SRC, FGR, YES	-1.4
AHSA2	130872	AHA1, activator of heat shock 90kDa protein ATPase homolog 2 (yeast)	-1.4
GLS	2744	glutaminase	-1.4
EVI2A	2123	ecotropic viral integration site 2A	-1.4
VCL	7414	vinculin	-1.4
PTPN1	5770	protein tyrosine phosphatase, non-receptor type 1	-1.4
AHNAK	79026	AHNAK nucleoprotein (desmoyokin)	-1.4
IRF8	3394	interferon regulatory factor 8	-1.4
CTBP1	1487	C-terminal binding protein 1	-1.4
PRKCA	5578	protein kinase C, alpha	-1.4
DDX43	55510	DEAD (Asp-Glu-Ala-Asp) box polypeptide 43	-1.4
SWAP70	23075	SWAP-70 protein	-1.4
SLC7A5	8140	solute carrier family 7 (cationic amino acid transporter, y+ system), member 5	-1.4
CD109	135228	CD109 molecule	-1.4
SFRS15	57466	splicing factor, arginine/serine-rich 15	-1.4
SPRY1	10252	sprouty homolog 1, antagonist of FGF signaling (Drosophila)	-1.4
FZD6	8323	frizzled homolog 6 (Drosophila)	-1.4
CD40	958	CD40 molecule, TNF receptor superfamily member 5	-1.4
AIM2	9447	absent in melanoma 2	-1.4
ZBTB38	253461	zinc finger and BTB domain containing 38	-1.4
TBC1D4	9882	TBC1 domain family, member 4	-1.4
DNAJC15	29103	DnaJ (Hsp40) homolog, subfamily C, member 15	-1.4
CRIM1	51232	cysteine rich transmembrane BMP regulator 1 (chordin-like)	-1.4
GNAI1	2770	guanine nucleotide binding protein (G protein), alpha inhibiting activity polypeptide 1	-1.4
RHOBTB3	22836	Rho-related BTB domain containing 3	-1.4
SCD5	79966	stearoyl-CoA desaturase 5	-1.4
KYNU	8942	kynureninase (L-kynurenine hydrolase)	-1.4
CHML	1122	choroideremia-like (Rab escort protein 2)	-1.4
DUSP16	80824	dual specificity phosphatase 16	-1.4
NT5E	4907	5'-nucleotidase, ecto (CD73)	-1.4
C17orf81	23587	chromosome 17 open reading frame 81	-1.4
SNTB1	6641	syntrophin, beta 1 (dystrophin-associated protein A1, 59kDa, basic component 1)	-1.4
RAB11FIP	80223	RAB11 family interacting protein 1 (class I)	-1.4
ZNFN1A1	10320	zinc finger protein, subfamily 1A, 1 (Ikaros)	-1.4
ACTN2	88	actinin, alpha 2	-1.4
C13orf25	407975	chromosome 13 open reading frame 25	-1.5
F5	2153	coagulation factor V (proaccelerin, labile factor)	-1.5



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CFLAR	8837	CASP8 and FADD-like apoptosis regulator	-1.5
IL10	3586	interleukin 10	-1.5
ARHGEF3	50650	Rho guanine nucleotide exchange factor (GEF) 3	-1.5
GAD1	2571	glutamate decarboxylase 1 (brain, 67kDa)	-1.5
IL17F	112744	interleukin 17F	-1.5
IL5	3567	interleukin 5 (colony-stimulating factor, eosinophil)	-1.5
ANXA1	301	annexin A1	-1.5
CPXM	56265	carboxypeptidase X (M14 family)	-1.5
LRRN3	54674	leucine rich repeat neuronal 3	-1.5
GOLGA8A	23015	golgi autoantigen, golgin subfamily a, 8A	-1.5
KLRC4	8302	killer cell lectin-like receptor subfamily C, member 4	-1.5
POLR1D	51082	polymerase (RNA) I polypeptide D, 16kDa	-1.5
RAB15	376267	RAB15, member RAS oncogene family	-1.5
CD160	11126	CD160 molecule	-1.5
EMP1	2012	epithelial membrane protein 1	-1.5
DAPK1	1612	death-associated protein kinase 1	-1.6
PRKY	5616	protein kinase, Y-linked	-1.6
DDX17	10521	DEAD (Asp-Glu-Ala-Asp) box polypeptide 17	-1.6
NDFIP1	80762	Nedd4 family interacting protein 1	-1.6
PLS3	5358	plastin 3 (T isoform)	-1.6
CXCL10	3627	chemokine (C-X-C motif) ligand 10	-1.7
CD200	4345	CD200 molecule	-1.7
XCL1	6375	chemokine (C motif) ligand 1	-1.7
C6orf160	387066	chromosome 6 open reading frame 160	-1.7
INSM1	3642	insulinoma-associated 1	-1.7
TNFRSF1B	7133	tumor necrosis factor receptor superfamily, member 1B	-1.7
CXCL9	4283	chemokine (C-X-C motif) ligand 9	-1.8
FTL	2512	ferritin, light polypeptide	-1.8
KSP37	83888	Ksp37 protein	-1.9
USP9Y	8287	ubiquitin specific peptidase 9, Y-linked (fat facets-like, Drosophila)	-1.9
PTPRK	5796	protein tyrosine phosphatase, receptor type, K	-1.9
GTSE1	51512	G-2 and S-phase expressed 1	-1.9
LAIR2	3904	leukocyte-associated immunoglobulin-like receptor 2	-2.0
HLA-DQA1	3117	major histocompatibility complex, class II, DQ alpha 1	-2.0
SMCY	8284	Smcy homolog, Y-linked (mouse)	-2.4
DDX3Y	8653	DEAD (Asp-Glu-Ala-Asp) box polypeptide 3, Y-linked	-4.4
EIF1AY	9086	eukaryotic translation initiation factor 1A, Y-linked	-6.7

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RPS4Y1	6192	ribosomal protein S4, Y-linked 1	-15.5
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**Table S3. sexually dimorphic "Response to Stimulus (GO:0050896)" genes in restimulated T Cells**

<b>Gene Symbol</b>	<b>Identifier</b>	<b>Gene Name</b>	<b>Fold change Female vs Male</b>
IFNG	3458	interferon, gamma	1.8
IL12RB2	3595	interleukin 12 receptor, beta 2	1.7
GNLY	10578	granulysin	1.7
GZMA	3001	granzyme A (granzyme 1, cytotoxic T-lymphocyte-associated serine esterase 3)	1.7
ENTPD1	953	ectonucleoside triphosphate diphosphohydrolase 1	1.7
LYZ	4069	lysozyme (renal amyloidosis)	1.6
CDH3	1001	cadherin 3, type 1, P-cadherin (placental)	1.6
HBEGF	1839	heparin-binding EGF-like growth factor	1.6
MIST	116449	mast cell immunoreceptor signal transducer	1.5
IL1F5	26525	interleukin 1 family, member 5 (delta)	1.5
MASP1	5648	mannan-binding lectin serine peptidase 1 (C4/C2 activating component of Ra-reactive factor)	1.5
ERAP1	51752	endoplasmic reticulum aminopeptidase 1	1.5
IRF7	3665	interferon regulatory factor 7	1.5
SOD3	6649	superoxide dismutase 3, extracellular	1.5
IFI44	10561	interferon-induced protein 44	1.5
CX3CL1	6376	chemokine (C-X3-C motif) ligand 1	1.5
TFPI	7035	tissue factor pathway inhibitor (lipoprotein-associated coagulation inhibitor)	1.5
ID3	3399	inhibitor of DNA binding 3, dominant negative helix-loop-helix protein	1.4
OAS3	4940	2'-5'-oligoadenylate synthetase 3, 100kDa	1.4
EPAS1	2034	endothelial PAS domain protein 1	1.4
NCR2	9436	natural cytotoxicity triggering receptor 2	1.4
TLR10	81793	toll-like receptor 10	1.4
TNFRSF11	8792	tumor necrosis factor receptor superfamily, member 11a, NFkB activator	1.4
IL20RA	53832	interleukin 20 receptor, alpha	1.4
ALDOB	229	aldolase B, fructose-bisphosphate	1.4
AVIL	10677	advillin	1.4
EIF2AK2	5610	eukaryotic translation initiation factor 2-alpha kinase 2	1.4

CXCL2	2920	chemokine (C-X-C motif) ligand 2	1.4
NPAS1	4861	neuronal PAS domain protein 1	1.4
OAS1	4938	2',5'-oligoadenylate synthetase 1, 40/46kDa	1.4
FGA	2243	fibrinogen alpha chain	1.4
TLK1	9874	tousled-like kinase 1	1.4
TRAT1	50852	T cell receptor associated transmembrane adaptor 1	1.4
AIF1	199	allograft inflammatory factor 1	1.4
IFITM2	10581	interferon induced transmembrane protein 2 (1-8D)	1.4
GAP43	2596	growth associated protein 43	1.4
AGXT	189	alanine-glyoxylate aminotransferase	1.4
EGFR	1956	epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) oncogene homolog, avian)	1.4
SPINK5	11005	serine peptidase inhibitor, Kazal type 5	1.4
IFI6	2537	interferon, alpha-inducible protein 6	1.4
DDX58	23586	DEAD (Asp-Glu-Ala-Asp) box polypeptide 58	1.4
TOPORS	10210	topoisomerase I binding, arginine/serine-rich	1.4
NPAS2	4862	neuronal PAS domain protein 2	1.4
BRE	9577	brain and reproductive organ-expressed (TNFRSF1A modulator)	1.4
LTB	4050	lymphotoxin beta (TNF superfamily, member 3)	1.4
IL16	3603	interleukin 16 (lymphocyte chemoattractant factor)	1.4
MBP	4155	myelin basic protein	1.4
NYX	60506	nyctalopin	1.4
HSPA14	51182	heat shock 70kDa protein 14	-1.4
CSDA	8531	cold shock domain protein A	-1.4
ZAK	51776	sterile alpha motif and leucine zipper containing kinase AZK	-1.4
IL17A	3605	interleukin 17A	-1.4
FYN	2534	FYN oncogene related to SRC, FGR, YES	-1.4
IRF8	3394	interferon regulatory factor 8	-1.4
PRKCA	5578	protein kinase C, alpha	-1.4
SWAP70	23075	SWAP-70 protein	-1.4
AIM2	9447	absent in melanoma 2	-1.4
IFNAR2	3455	interferon (alpha, beta and omega) receptor 2	-1.4
F5	2153	coagulation factor V (proaccelerin, labile factor)	-1.5
IL10	3586	interleukin 10	-1.5
IL17F	112744	interleukin 17F	-1.5
IL5	3567	interleukin 5 (colony-stimulating factor, eosinophil)	-1.5

ANXA1	301	annexin A1	-1.5
CD160	11126	CD160 molecule	-1.5
ERAP1	51752	endoplasmic reticulum aminopeptidase 1	-1.6
CXCL10	3627	chemokine (C-X-C motif) ligand 10	-1.7
XCL1	6375	chemokine (C motif) ligand 1	-1.7
CXCL9	4283	chemokine (C-X-C motif) ligand 9	-1.8
GTSE1	51512	G-2 and S-phase expressed 1	-1.9
HLA-DQA1	3117	major histocompatibility complex, class II, DQ alpha 1	-2.0