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Original Article

pSTAT3 Y705 is a prognostic biomarker identified from time-series gene expression profiles of a chemically induced mouse model of hepatocellular carcinoma

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Abstract: Development of hepatocellular carcinoma (HCC) is a dynamic process that includes a spectrum ranging from precancerous exposure to carcinogenesis and metastasis stages. In this process, numerous dysregulated genes resulted in aberrant activation or inhibition of signaling pathways. Herein, time-series gene expression profiles of dimethylnitrosamine (DEN)-induced mice with HCC covering different stages are provided. Gene expression patterns of liver tissues were detected at different time intervals [0 (negative control; NC), 15, 28, 30, and 42 weeks]. A comparison of gene expression between DEN-treated groups and NC yielded a total of 726 differentially expressed genes (DEGs), 76 of which were enriched in 10 statistically significant Kyoto Encyclopedia of Genes and Genomes (KEGG) signaling pathways (adjusted p value <0.05). After assessing regulation among these cascades, we found that Stat3 was a crucial transcription factor. Additionally, it was a connector in the PPI network constituting the 76 DEGs. Western blotting and immunohistochemistry suggested that the phosphorylation of Stat3 at tyrosine 705 (pStat3 Y705) was down-regulated in early stage HCC. Following, survival analysis revealed that patients with down-regulated pSTAT3 Y705 exhibited reduced overall survival rates in both the early stage and well-differentiated groups (p=0.00022 and p=0.0026, respectively). This is the first study evaluating dynamic gene expression profiles in a time-series DEN-induced mouse HCC model. Stat3 was identified as a crucial node during HCC progression, and pSTAT3 Y705 serves as a prognostic biomarker for early-stage HCC.

Keywords: Hepatocellular carcinoma, mouse models, gene expression profiles, pSTAT3 Y705, prognostic biomarkers

Introduction

Hepatocellular carcinoma (HCC) represents the second leading cause of digestive-cancer-related death and is the seventh most frequently diagnosed cancer [1]. The main risk factors of HCC include chronic hepatitis, excessive alcohol intake, and chemical carcinogens exposure [2]. After continuous exposure to risk factors, liver disease usually evolves from hepatitis, cirrhosis and atypical hyperplastic nodules to HCC and metastasis [3]. Various oncogene and tumor suppressor-containing networks and cascades are involved in this evolution process. Although there have been numerous studies about genes and cascades involved in hepatocellular carcinogenesis, research focusing on the dynamic changes of genes and pathways in HCC development is still very rare. It is difficult to explore the dynamic changes in human HCC, due to ethics concerns and limitations in sampling and follow-up. Therefore, an HCC mouse

model is an acceptable substitution, as it is able to simulate the histological and molecular features of human HCC. For several decades, carcinogen-induced HCC mouse models have been applied in molecular mechanism and preclinical research; the most extensively adopted is the dimethylnitrosamine (DEN)-induced mouse model [4]. Despite plentiful studies involving this model, no studies have yet utilized the model to simulate the dynamic progression of hepatocellular carcinogenesis.

The progression from oncogenesis to metastasis is dynamic, involving multiple steps, including inflammation, accelerated cellular proliferation, cellular malignant transformation, cancer cell migration, and growth at a new site [5, 6]. During progression, various dysregulated genes dynamically exert their influence, and these genes compose interacting pathways and networks. Recently, high-throughput omics technology (e.g., microarrays, deep sequencing, proteomics) and bioinformatics approaches have promoted studies of the pathways and networks constituted by differentially expressed genes (DEGs). Meanwhile, the development of databases containing clinical and molecular information has facilitated research from bench to bedside. Thus far, many functional experimental studies of pathways have identified that the JAK-STAT pathway and its crucial gene, signal transducer and activator of transcription 3 (Stat3), are involved in the occurrence and development of HCC [7, 8]. However, scarce research has focused on the dynamic changes of STAT3 phosphorylation in the progression of hepatocarcinogenesis.

In this research, we established a time-series DEN-induced mouse model ranging from carcinogen exposure to atypical hyperplastic nodules, HCC, and metastasis. Gene expression profiles from livers and neoplastic samples were then analyzed with Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment and a minimum connected dominating set (MCDS) algorithm. Stat3 was identified as acting as a hub node in 726 DEGs when comparing gene expression between DEN-treated groups and negative controls. Interestingly, one of its phosphorylation events (pStat3 Y705) fluctuated during HCC development. Finally, we found that pSTAT3 Y705 predicts HCC prognosis at both highly differentiated and early-stage HCC.

Methods and materials

DEN-induced mouse model

Two-week-old male C57BL/6 mice (12-15 g weight) were purchased from Beijing Vital River Laboratory Animal Technology Co., Ltd. (Beijing, China) and were maintained at the Animal Experiment Center in the First Affiliated Hospital, School of Medicine, Zhejiang University. A total of 30 mice were housed under a 12-hour dark/light cycle and were randomly divided into two groups: (1) the healthy control group (NC, n=6): the mice were given a single intraperitoneal injection of saline; and (2) the HCC model group: HCC was induced in the remaining 24 mice with an intraperitoneal injection of DEN (10 mg/kg weight, Sigma Chemical Co., St. Louis, MO, USA). The development HCC in the model was dynamically observed, and the mice were sampled at 15 weeks (n=6), 28 weeks (n=6), 30 weeks (n=6) and 42 weeks (n=6) after DEN injection. The histology of liver and lung tissues was determined by hematoxylin and eosin (H&E) staining. The animal experiments were approved by the Institutional Animal Care and Use Committee of the First Affiliated Hospital, School of Medicine, Zhejiang University. All experiments were performed according to the regulations described by the Declaration of Helsinki and the National Institutes of Health Guide for the Care and Use of Laboratory Animals.

Whole-genome expression profiles

Total RNA was extracted and purified using a mirVana™ miRNA Isolation Kit (Ambion) following the instructions of the manufacturer, and extracted samples were checked for RIN number by an Agilent Bioanalyzer 2100 (Agilent technologies) to confirm RNA integrity. Total RNA was amplified, labeled and purified using a GeneChip 3' IVT PLUS Reagent Kit (Affymetrix) following the manufacturer's instructions to obtain biotin-labeled cDNA. Array hybridization and washing were performed using a GeneChip® Hybridization, Wash and Stain Kit (Affymetrix) in a Hybridization Oven 645 (Affymetrix) and a Fluidics Station 450 (Affymetrix) following the manufacturer's instructions. Slides were scanned by a GeneChip® Scanner 3000 (Affymetrix) and Command Console Software 4.0 (Affymetrix) with

default settings. GeneSpring GX 11.5 software was utilized identify DEGs, and *p*-value were adjusted by false discovery rate for multiple comparisons of DEGs at different observation points. DEGs were defined as follows: 1. $\log_2$ (fold change of gene expression between groups) ($\log_2$FC) ≥1 (up-regulated) or ≤-1 (down-regulated); 2. False discovery rate adjusted *p*-value (FDR-adj *p*-value) <0.05.

Quantitative real-time polymerase chain reaction (qRT-PCR)

Total RNA was extracted from liver and tumor tissues using TRIzol reagent (Invitrogen). A PrimeScript RT Reagent Kit with gDNA Eraser (Takara) was used for reverse transcription according to the manufacturer's instructions. PCR was performed with the SYBR Premix Ex Taq II (Tli RNaseH Plus) on an ABI PRISM 7900 instrument (Applied Biosystems). The expression level of mouse beta-actin was used as the internal control. The transcription levels of target genes were determined according to the 2-ΔCT method. Histograms of PCR results were plotted with GraphPad Prism 7.0. All primers are listed in Supplementary Table 1.

Immunohistochemistry

The liver and tumor tissues were fixed with 4% formalin for no less than 48 h, and were paraffin-embedded. Then all the tissues were sliced into 4-μm-thick sections. After deparaffinization and rehydration, antigen retrieval was performed in 10 mM sodium citrate pH 6.0 15 mins with microwave. Subsequently the sections were washed, then were incubated at 4 degree Celsius with primary antibodies (1:100 dilution Abcam ab76315, Phospho-Stat3 Tyr705, 1:250 dilution Abcam ab32143, Phospho-Stat3 Ser727, 1:300 dilution CST 9139, Stat3). Next, the sections was incubated with HRP-conjugated second antibodies and the immunocomplex, and was viewed using a DAB. Six random field of view for each section were chosen to analyze the positive staining area with Image-Pro Plus 6.0 under uniform standards. The relative expression of each sample is calculated by normalizing the positive staining area.

Western blotting

The liver and tumor tissues were washed twice with PBS and then lysed with RIPA+Halt™ Protease Inhibitor Cocktail (ThermoFIsher). The impurities in lysates were removed by centrifugation. The lysates were then denatured by boiling in loading buffer (Invitrogen). Equal amounts of protein were loaded in each well on a 10% sodium dodecyl sulfate-polyacrylamide gel and were separated by electrophoresis. Next, the proteins were electrotransferred onto polyvinylidene fluoride membranes, which were then blocked with 5% not-fat milk at room temperature for 1 hour. Subsequently, the membranes were incubated with primary antibodies (beta-Actin, Stat3 (79D7), Phospho-Stat3 (Tyr705) (D3A7), Phospho-Stat3 (Ser727) (6E4), Cell Signaling Technology; 1:2000 dilution) at 4°C overnight and were then incubated with horseradish peroxidase-conjugated secondary antibody (1:4000 dilution) for 1 hour at room temperature. Specific immune complexes were detected with chemiluminescence reagents (EZ-ECL KIT, Biological Industries).

Transcription factors and TCGA data

Transcription factor data were downloaded from AnimalTFDB3.0 (http://bioinfo.life.hust.edu.cn) [9]. The Cancer Genome Atlas Liver hepatocellular carcinoma reverse phase protein arrays (TCGA-LIHC RPPA) data were downloaded from University of Texas MD Anderson Cancer Center (http://www.tcpaportal.org/tcpa/download.html, accessed June 18, 2018). The corresponding clinical data for TCGA-LIHC patients were acquired from the University of California Santa Cruz Xena browser (UCSC Xena: http://xena.ucsc.edu/, accessed June 18, 2018).

Enrichment and PPI network analysis

KEGG pathway enrichment analysis was performed using the clusterProfiler package [10]. The PPI network was generated with the String website (https://string-db.org) and Cytoscape software (version 3.6.1, http://www.cytoscape.org/, accessed June 18, 2018). Gene Ontology enrichment and MCDS were performed using two applications (ClueGo and MCDS) in Cytoscape [11, 12]. Structures of Stat3 were plotted with IBS software [13].

Cohort and specimens

120 American Joint Committee on Cancer (AJCC) stage I and II HCC patients were includ-

ed in our study. All the patients were undergoing curative tumor resection in The First Affiliated Hospital, Zhejiang University School of Medicine from 2012 Jan to 2016 Aug. Before operation, none of them received any anticancer treatment. HCC tissue and corresponding peritumor tissue from the patients were collected. All the patients signed the consents informed, and the study protocol was approved by the ethics committee of The First Affiliated Hospital, Zhejiang University School of Medicine.

Cell culture

Human HCC SUN-449, Huh7, SK, EW7, HepG3, HepG2, Li7 were purchased from the Cell Bank of China (Shanghai, China). Cells were cultured in DMEM (Thermo) supplemented with 10% fetal bovine serum (FBS, Thermo) at 37°C in 5% CO_2. The pSTAT3 Y705 inhibitor cryptotanshinone was purchased from MCE company (New Jersey, USA).

Cell proliferation assay

Cells were plated in 96-well plates at a density of 2500-3000 cells/well. One night later, cells were treated with cryptotanshinone in different concentrations. 48 hours later, CCK-8 was carried out to evaluate the cell proliferation rates. The CCK-8 assay was purchased from MCE MCE company (New Jersey, USA).

Statistical analysis

The clustering heatmap was generated with the pheatmap R package. The Euclidean distance among DEGs was calculated with the ward. D algorithm. According to Shapiro-Wilk normality test results, Student's test or the Mann-Whitney test was used for comparisons between two groups, and ANOVA or the Kruskal-Wallis test was used for comparisons between three or more groups. Multiple comparisons were corrected by the Tukey or Benjamini and Hochberg method. The Pearson or Spearman method was adopted in the correlation analysis based on the Shapiro-Wilk normality test results. All RT-PCR data are presented as the means with SEM. A *p*-value <0.05 was considered statistically significant. Overall survival rate was analyzed using the Kaplan-Meier method, and survival curves were generated with the survival and survminer packages. All statistical analyses were performed using GraphPad Prism 7.0.

Results

Development of HCC in a DEN-treated mouse model

The model construction and the sampling intervals are shown in **Figure 1A**. Fifteen weeks after the administration of DEN, no macroscopic foci were identified in mouse livers. Histopathological investigation revealed the absence of evident nuclear atypia, except for mild hepatocyte swelling. At 28 weeks after administration, there were no macroscopically identifiable dysplastic nodules in livers. However, microscopic examination identified dysplastic nodes, and prominent nuclear atypia were found in the nodes. At 30 weeks after DEN treatment, the tumors showed increased size and hyperchromatic nuclei, as well as loss of normal lobe-like structure, resembling the typical morphological features of HCC. Notably, multiple tumors were present at the 42nd week and were characterized by poorly differentiated tumor cells (**Figure 1B** and **1C**). With respect to spontaneous distant metastasis, visible pulmonary metastases in DEN-treated mice were detected only at the 42nd week, which was further confirmed by the histopathological examination. Both macro- and microscopic examinations revealed the absence of metastatic foci in the lungs of all 30-week DEN-treated mice (**Figure 1D** and **1E**). These data supported that these hepatic tumors, across the four observation points selected in our DEC-treated mouse model (15th, 28th, 30th and 42nd weeks), may reflect the dynamic process of HCC oncogenesis and stepwise progression and correspond to carcinogen exposure, dysplastic nodules, carcinogenesis and distant metastasis.

Identification of differentially expressed genes and KEGG pathway enrichment

Microarray analysis was performed on liver tissues and all tumors isolated from the livers of DEN-treated mice to determine the gene expression profiles. A total of 726 DEGs were identified through the comparison of gene expression levels between NC and DEN-treated mice. The distributions of DEGs at different time points are illustrated in **Figure 2A**, with

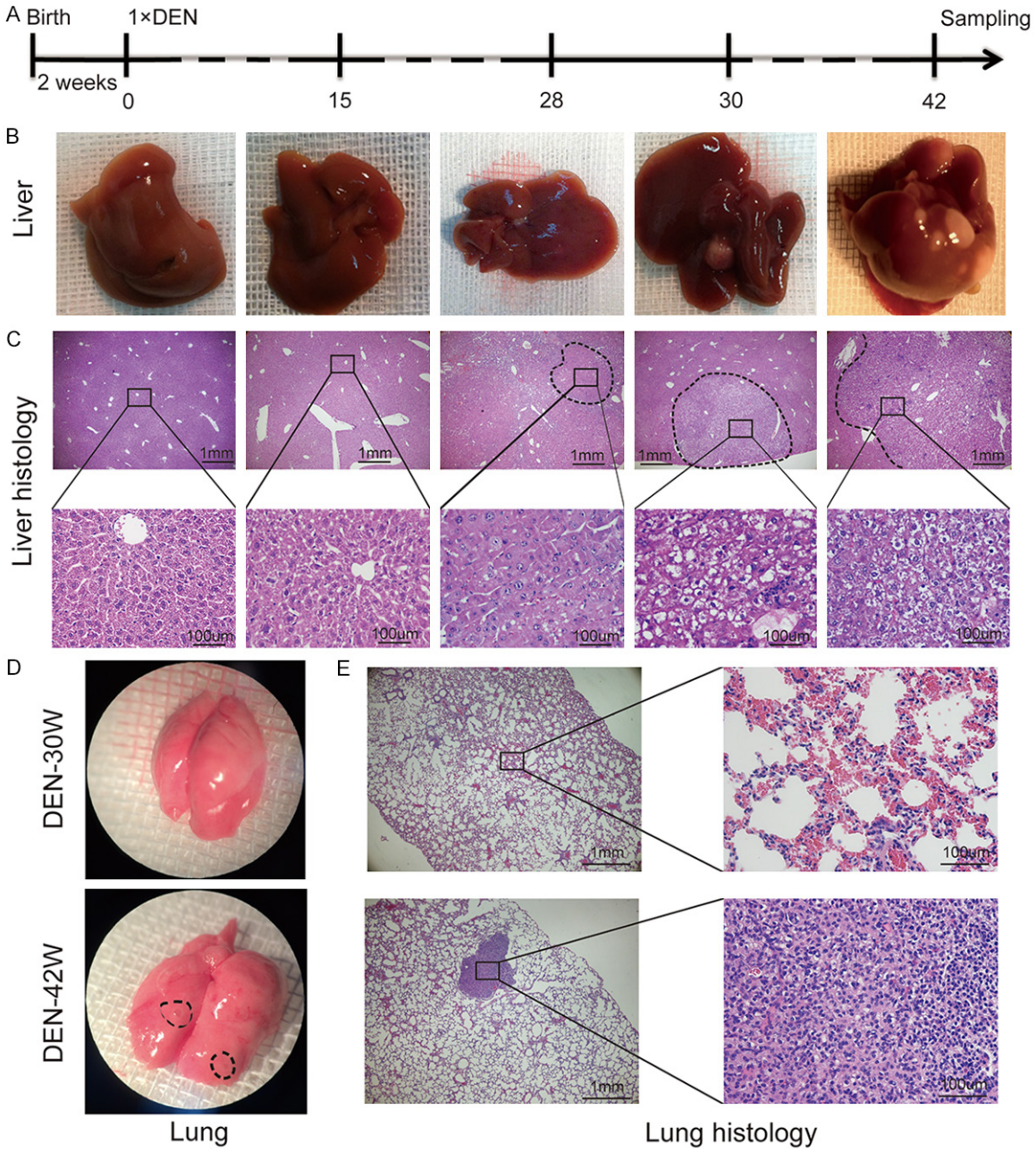

Figure 1. Liver and tumor tissues in the DEN-induced HCC mouse model. A. A flowchart showing the process of constructing the HCC model. Mice were injected with DEN at 2 weeks after birth. The livers were harvested at the 15th, 28th, 30th and 42nd weeks. B. A series of images showing macroscopic changes in liver morphology at each time point. C. Histological images of liver tissue sections stained with H&E corresponding to each time point. Atypical hyperplastic nodules were found at the 28th week. Typical HCC morphological changes were confirmed at the 30th week, and poorly differentiated HCC was found at the 42nd week. D. The images show the macroscopic changes in lung morphology at the 30th and 42nd weeks. No metastasis found in the lung at 30th week macroscopically, but visible metastases in the lung at 42nd week. E. Histological images of lungs at the 30th and 42nd weeks. Pulmonary metastasis was confirmed at only at 42nd week, while not at 30th week.

details of the symbols, $\log_2$FC and adjusted *p*-value listed in Supplementary Table 2. As the clinical management and prognosis of HCC are well known to vary greatly by the presence of metastatic events, we next focused on the dynamic changes in gene expression patterns that were correlated with the onset of distant metastasis. The 42nd week after DEN treatment

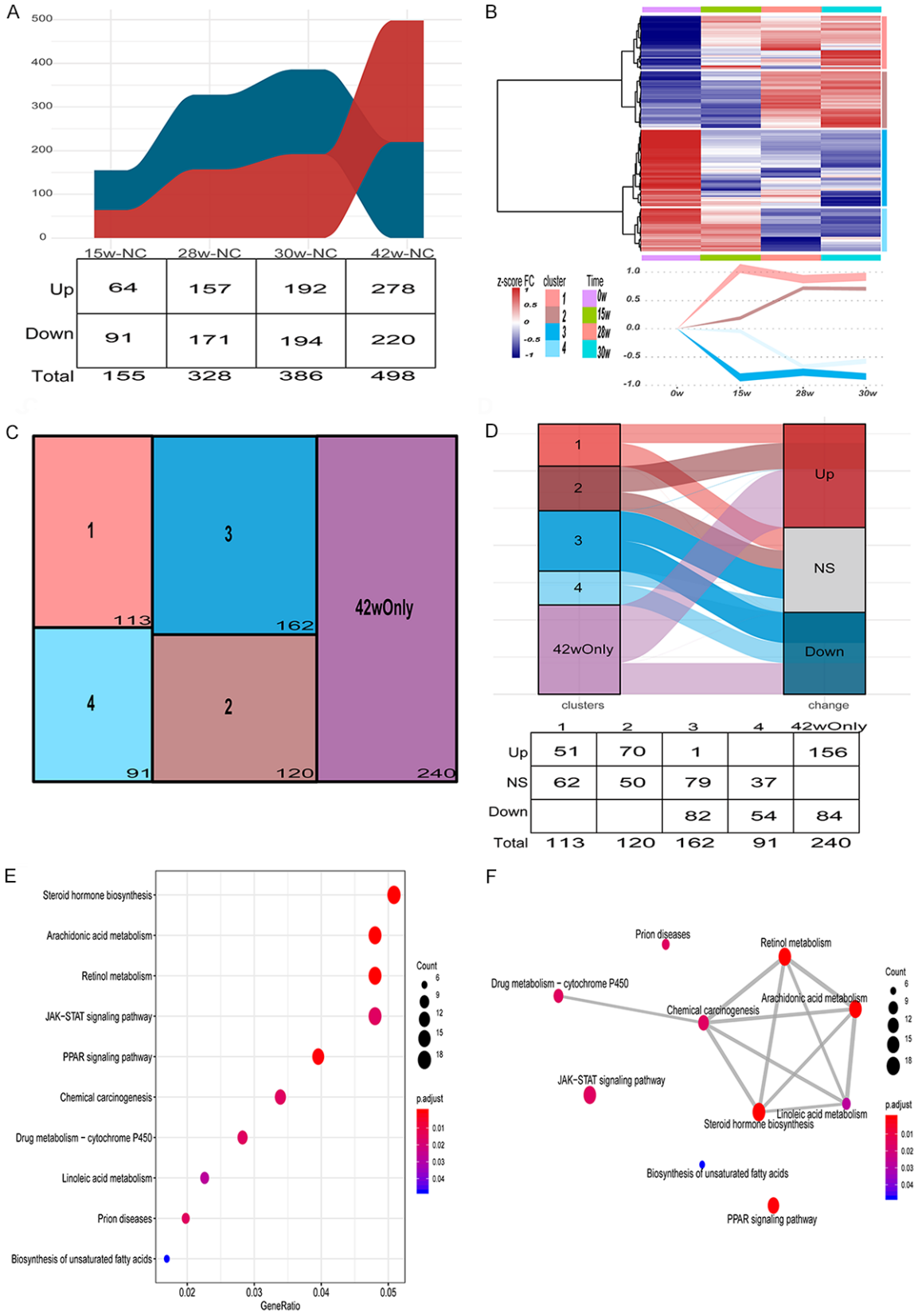

Figure 2. Identification of DEGs and KEGG signal pathway enrichment. A. An alluvial diagram showing DEGs in the four DEN-treated groups compared with the NC group. Gene counts of the 4 different stages are shown in the table.

B. A cluster heatmap macroscopically showing the log_2-fold changes in all DEGs from 15 weeks to 30 weeks and their gene clusters. The line chart shows the expression patterns of the 4 clusters of DEGs. C. A proportion map displaying proportions of 5 clusters of DEGs. The gene counts of different clusters are labeled in the lower right corner. D. A Sankey diagram visualizing the expression tendencies in the 5 clusters of DEGs at 42 weeks. The expression patterns of the different clusters are shown in the table. NS: Not significant. E. All significantly enriched KEGG pathways are exhibited in the dot plot. The dot size reflects the counts in the signal pathway, and adjusted *p*-values are mapped on the filled colors of nodes. F. The regulation among all significantly enriched KEGG pathways is visualized in the networker. The dot size reflects the counts in the signal pathway, and adjusted *p*-values are mapped on the filled colors of nodes.

was selected in our model as a time point to mimic the metastatic stage of HCC. Using the ward. D algorithm, all DEGs before the 42nd week could be divided into the following 4 clusters (**Figure 2B**). DEGs continuously up-regulated were included in cluster 1 (n=113); those continuously down-regulated in cluster 3 (n=162); those up-regulated from precancerous to carcinogenesis in cluster 2 (n=120); and those down-regulated from precancerous to carcinogenesis in cluster 4 (n=91). An interesting finding was that when it comes to metastatic stage (42nd week), a considerable proportion of genes (n=240) whose primary expression levels did not differ between DEN-treated mice and NC evolved as DEGs in the 42nd week (**Figure 2C**). Nearly half of DEGs primarily distributed in the aforementioned four clusters in DEN-treated mice showed no significant changes when compared with those of the NC group. Specifically, a total of 62 (54.8%) DEGs in cluster 1, 50 (41.6%) DEGs in cluster 2, 79 (48.7%) DEGs in cluster 3 and 37 (40.6%) DEGs in cluster 4 were identified whose expression levels did not differ from the NC. Specifically, 156 genes were up-regulated and 84 were down-regulated in 42nd week DEN-treated mice when compared with the NC (**Figure 2D**). Of particular note, the expression level of Abcb1, a DEG in cluster 3, was reversed. The expression of Abcb1 was continuously down-regulated from the 15th week to the 30th week but was up-regulated in the 42nd week. These observations demonstrated that the expression patterns of most DEGs were not reversed in the progression of HCC. For this reason, the fold changes of DEGs in different stages could be represented with their average fold changes in subsequent research. In addition, the internal comparisons of gene expression profiles in DEN-treated mice at different time points are shown in Supplementary Figure 1, with details listed in Supplementary Table 3.

Aberrant gene expression may lead to the dysfunction of cascades. To investigate the pathways associated with dynamic changes in gene expression across four stages, KEGG pathway enrichment analysis was implemented for 726 DEGs to compare the DEN-treated group and the NC. A total of 354 (48.8%) DEGs were enriched in 282 KEGG pathways (Supplementary Table 4). Of these KEGG pathways, 10 cascades showed statistical significance (adjusted P<0.05; **Figure 2E**) with a total of 76 (10.5%; Supplementary Figure 2) DEGs enriched. To distinguish mutual regulation among pathways, a network diagram was constructed according to the interaction of 10 KEGG pathways (**Figure 2F**). As shown in the diagram, 5 pathways were directly associated with the Chemical carcinogenesis pathway. In the other four independent signal cascades, most DEGs were enriched in the JAK-STAT (17 DEGs) and PPAR (13 DEGs) signaling pathways, while only 7 and 6 DEGs were clustered in the Prion diseases and Biosynthesis of unsaturated fatty acids pathways, respectively. The distribution of DEGs in the four signal cascades suggested that the JAK-STAT and PPAR pathways play major roles in the indirectly associated Chemical carcinogenesis cascade.

Stat3 is a crucial transcription factor among differentially expressed genes

It is known that numerous extranuclear signals are transmitted to intranuclear signals by transcription factors (TFs), and their differential expression frequently results in the disorder of numerous genes. Therefore, we focused on TFs in ten of the significantly enriched pathways mentioned above. Based on the AnimalTFDB3.0 database, 2 TFs (Stat3, Pparg) were identified from the JAK-STAT and PPAR pathways, respectively. Moreover, 4 co-transcription factors (Prnp, Pim1, Egfr, Ccnd1) were detected, three of which (Pim1, Egfr, Ccnd1) were from the JAK-STAT cascade. In the following research, we established networks of transcription factors according to the correlation coefficients among transcription factors. The transcription factor

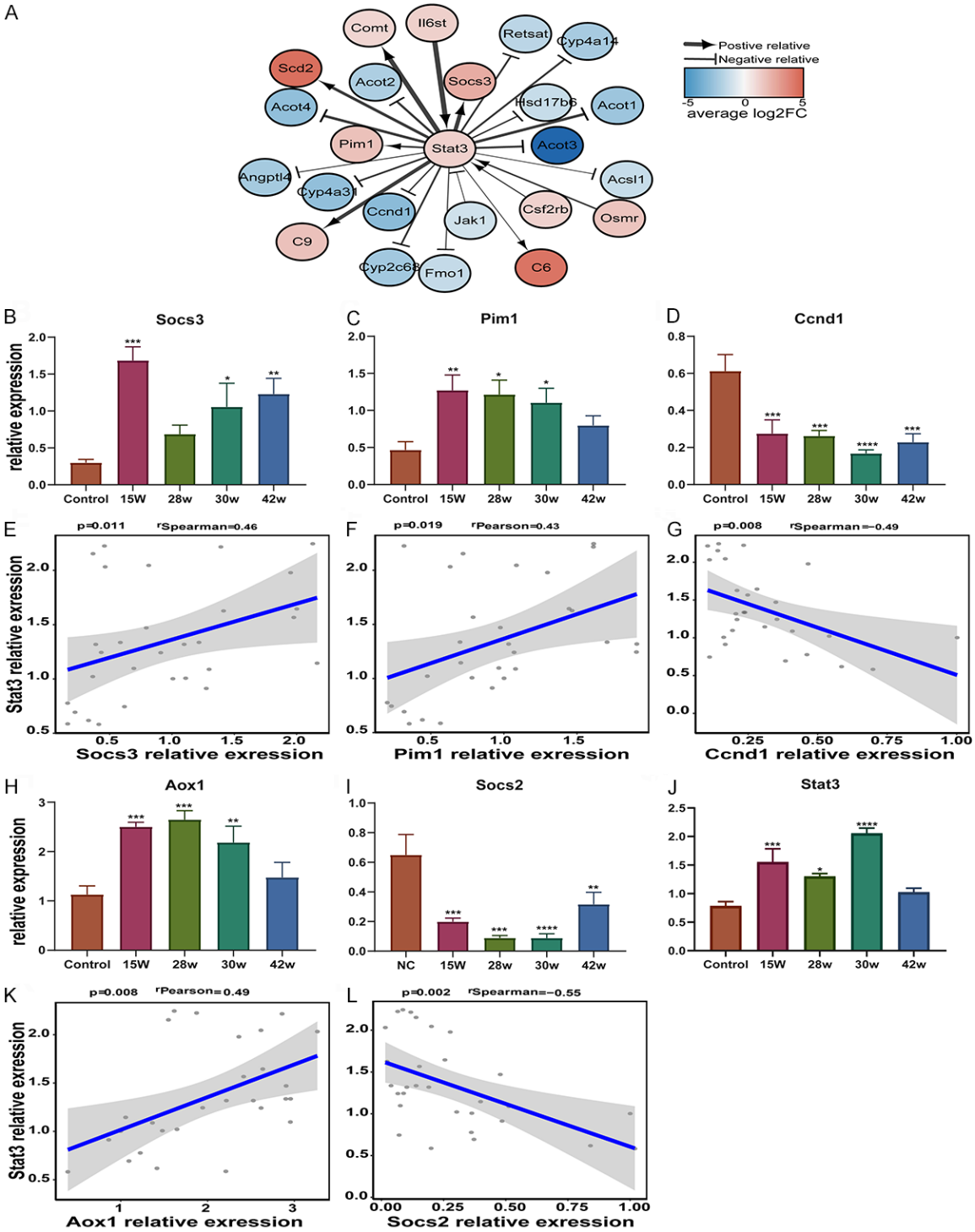

Figure 3. Transcription factor analysis. A. A network visualizing the genes and their correlations with Stat3. The color in the node represents the average $\log_2$ fold change. The shape of the pointer represents positive or negative regulation. The size of the line represents correlation degree between two genes. B-D, H-J. Real-time PCR results of downstream DEGs in the JAK-STAT pathway, including Socs3, Pim1, Ccnd1, Aox1, Socs2 and Stat3 (bars represent SEM, and bold lines inside the box plot represent median levels). All comparison were between NC group or 15th week, 28th week, 30th week, 42nd week. Levels of significance: *P<0.05; **P<0.005; ***P<0.0005; ****P<0.0001; E-G, K, L. Socs3, Pim1, Ccnd1, Aox1, Socs2 degree of correlation with Stat3 are shown in the linear regression plots. Pearson or Spearman correlation coefficient is chosen based on Shapiro-Wilk normality test results. Blue line is trendline, and gray region represented confidence intervals of linear regression in the graphs.

networks demonstrated that the expression of Stat3 was significantly correlated with 23 DEGs (**Figure 3A** and Supplementary Table 5, while only 18 DEGs were associated with Pparg (Supplementary Figure 3A; Supplementary Table 6). As a result, Stat3 was more influential in signal transmission during HCC development.

To validate the transcription role of Stat3, real-time PCR (RT-PCR) was performed to investigate the expression levels of Stat3, three Stat3-regulated DEGs (Socs3, Pim1, Ccnd1) and three downstream DEGs (Socs2, Aox1, Aox3) in the JAK-STAT pathway at different HCC stages (**Figure 3B-D**, **3H** and **3I**). Consequently, five out of the six DEGs (Socs1, Pim1, Ccnd1, Aox1 and Socs2) showed significant correlations with Stat3 (**Figure 3E-G**, **3K**, **3L**), and differential expression profiles were identified. The RT-PCR expression pattern of Stat3 was similar to the microarray results, indicating continuous up-regulation (**Figure 3J**). Although Aox3 had no significant correlations with Stat3 (Supplementary Figure 3B, 3C), its expression was significantly up-regulated. The results strongly proved the activation of the JAK-STAT pathway at the transcription level.

Protein-to-protein interaction network analysis confirmed Stat3 as a major connector

As has been fairly well recognized, the differential expression of genes may affect the expression of proteins. DEGs can mediate a series of abnormal interactions among proteins. Subsequently, we aimed to investigate the protein-to-protein interactions (PPIs) among these DEGs. A PPI network was constructed using the String database (Supplementary Figure 4). Minimum connected dominating set (MCDS) analysis was applied to analyze the PPI network, an algorithm that can identify connectors and dominators based on number of connections. A total of 6 connectors and 16 dominators were identified in the PPI network (**Figure 4A**). Two connectors, hydroxy-delta-5-steroid dehydrogenase-3-beta steroid delta-isomerase 5 (Hsd3b5) and Stat3, were demonstrated as the central hubs in this PPI network. There were 18 proteins connected with Stat3 (**Figure 4B**), and 10 of them were significantly involved in 8 different biological processes (Supplementary Figure 4B). Regarding Hsd3b5, 27 proteins connected with it, but only 6 proteins were enriched in 3 biological processes (Supplementary Figure 4C and 4D). These results strongly suggested that Stat3 would be a more influential protein in activating the cancer-associated pathways and promoting HCC development.

To further understand the underlying roles of Stat3 in HCC progression, we performed Western Blotting (WB) to detect its protein expression and phosphorylation levels. Of note, Stat3 has two alternatively spliced isoforms: Stat3-alpha and its truncated version, Stat3-beta. Stat3-alpha can be phosphorylated at both tyrosine 705 (pStat3 Y705) and serine 727 (pStat3 S727), while Stat3-beta lacks the Ser727 phosphorylation site thus can only be phosphorylated at tyrosine 705 (**Figure 4C**). Consistently, the WB results displayed two separated bands of pStat3 Y705 (from Stat3-alpha and Stat3-beta, respectively) and only one band of pStat3 S727 (from Stat3-alpha only), though the total Stat3 had only one band due to the usage of antibody that can only distinguish Stat3-alpha. Of great interest, pStat3-beta Y705 could not be detected in NC group. And by the 15th week, it became detectable and experienced down-regulation along with the progression of HCC. In contrast, the pStat3-alpha Y705 was undetectable at the 15th and 28th weeks but stained in high levels at the 30th and 42nd weeks. Expression of Stat3 and pStat3 S727 were only decreased in 15th week (**Figure 4D**). Following, immunohistochemistry (IHC) was carried out to verify the expression patterns of these proteins. The results revealed that expression of pStat3 Y705 was consistent with the results of WB, which was absent in NC group and became detectable at 15th week. In particular, the expression level of pStat3 Y705 was remarkably down-regulated at 28th week. Meanwhile, Stat3 and pStat3 S727 expression patterns were also validated (**Figure 4E**). These data highlighted that pStat3 Y705 is nonexistent at normal tissue, and down-regulated in early stage HCC. Furthermore, pStat3 Y705 could be divided alpha and beta isoform during HCC progression. Its unique expression pattern strongly suggested that pSTAT3 Y705 could function as a signal for early-stage HCC.

pSTAT3 Y705 clinical relevance in early stage HCC

According to the results mentioned above, we hypothesized that the expression of pSTAT3

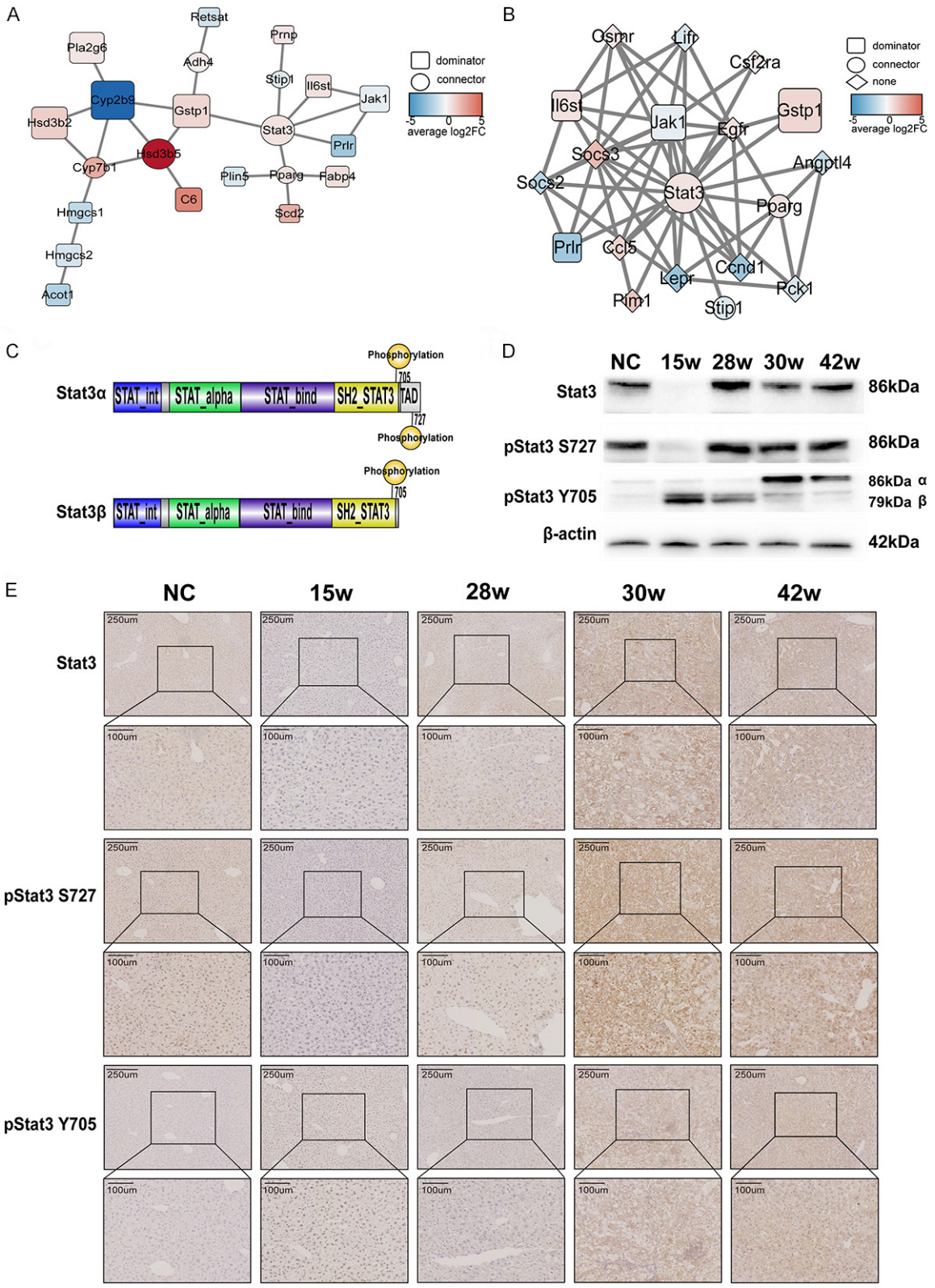

Figure 4. Protein-to-protein network analysis. A. A network diagram showing all connectors and dominators in the PPI network. The color in the nodes represents the average $\log_2$ fold change of each DEG. The different roles in the PPI network are represented by different shapes. B. A network diagram exhibiting all proteins connected with Stat3 and their roles in the PPI network. The color in the nodes represents the average $\log_2$ fold change of each DEG. The

different roles in the PPI network are represented by different shapes. C. Protein structure diagram shown the differences between Stat3-alpha and Stat3-beta. D. Western blotting results showing Stat3 and phosphorylated Stat3. The results suggest that pStat3 Y705 expression was undetectable in the NC group. Only pStat3 Y705 expression was observed in the 15th week group. In the 28th week group, pStat3 Y705 expression was markedly decreased. In the 30th week, pStat3 Y705 expression was obviously increased, while its expression was decreased in the 42nd week group. Stat3 and pStat3 S727 have similar expression tendencies and are only absent in the 15th week group. E. Immunohistochemistry (IHC) images for Stat3, pStat3 Y705 and pStat3 S727 in five different groups. Their expression of IHC in five different groups were analogous with the expression of WB.

Y705 could be used as a novel biomarker for predicting the prognosis of early-stage HCC patients. To explore the clinical relevance of pSTAT3 Y705, 120 patients with Stage I and II HCC (Grade = G1, n=5; Grade = G2, n=78; Grade = G3, n=37) from our cohort were included in this research. As expected, the IHC results demonstrated that the expression level of pSTAT3 Y705 in well-differentiated (G1+G2) HCC was significantly higher than in poor-differentiated (G3) HCC (P=0.0362, **Figure 5A** and **5B**). For further validation, we collected and analyzed the Stage I+II LIHC clinical cohort with the corresponding RPPA data in TCGA database. Consistent with the IHC results, well-differentiated LIHC had a remarkably higher pSTAT3 Y705 expression level compared with poorly differentiated LIHC (G1 vs. G2, P=0.0311; G1 vs. G3, P=0.007, **Figure 5C**). In addition, patients with AFP ≤400 ng/ml exhibited increased expression of pSTAT3 Y705 (P=0.0245, **Figure 5D**). To investigate its function as a prognosis biomarker, survival analyses were further performed. Patients were divided into high and low groups according to the median pSTAT3 Y705 level. Kaplan-Meier analysis revealed that the high expression level of pSTAT3 Y705 was significantly associated with superior overall survival (OS) rates in patients with early-stage HCC (stage I+II) or well-differentiated HCC (G1+G2) (p=0.00022 and p=0.0026, respectively, **Figure 5E** and **5F**). In stage I+II patients, the 1-, 3-, and 5-year OS rates in the high- and low-level groups were 96.3% vs. 71.1%, 81.1% vs. 39.1%, and 73.0% vs. 23.5%. Likewise, in the G1+G2 group, the 1-, 3-, and 5-year OS rates were 88.5%, 69.2% and 50.3% for patients with high pSTAT3 Y705 and 63.6%, 32.0%, and 21.3% for those with low pSTAT3 Y705. However, there was no significant difference in OS between the high- and low-level pSTAT3 Y705 groups in patients with late-stage HCC (Stage III+IV) HCC or poor-differentiated HCC (G3+G4) HCC (Supplementary Figure 5A, 5B). These results strongly indicated that pSTAT3 Y705 is a signal for early HCC development and its down-regulation predicted the poor prognosis of early HCC patients. To better understand the clinical translation potential of pSTAT3 Y705, we also evaluated its expression status in HCC cell lines (**Figure 5G**). 3 HCC cell lines with different pSTAT3 Y705 levels (low: SUN-449, medium: Huh7, high: Hep2) were chosen for the treatment with cryptotanshinone (highly selectively inhibitor of pSTAT3 Y705) under different concentration. And then the cell viability was measured by the CCK-8 assay after 48 h of the treatment. Half-maximal inhibitory concentration (IC50) of HepG2 was 1.02 ug/ml. The IC50 of Huh7 and SUN-449 were 1.76 ug/ml and 13.18 ug/ml, respectively. The results demonstrated that HCC cells with high expressed pSTAT3 Y705 could be dramatically inhibited by the treatment of cryptotanshinone, underlining this drug might be an efficient solution for treating HCC patients with high level of pSTAT3 Y705 (**Figure 5H**).

Discussion

In this study, we explored gene expression profiles in DEN-induced mouse HCC over a time-series. A total of 726 DEGs were identified in a comparison of DEN-treated and NC mice, 76 of which were enriched in 10 KEGG pathways. Stat3 was an important TF that acted as a connector in the PPI network composed of DEGs from the 10 pathways after performing MCDS analysis. After determination of Stat3 expression and its phosphorylation, we found that pStat3 Y705 was likely suitable as an HCC biomarker due to its unique expression tendency. RPPA and clinical data from TCGA-LIHC were then utilized to explore pSTAT3 Y705 expression patterns and prognostic values. The results demonstrated that the down-regulation of pSTAT3 Y705 is an indicator of poor prognosis. Our findings indicated that dynamic changes in gene expression over the progression of HCC can be revealed and that molecular markers with clinical significance can be identified

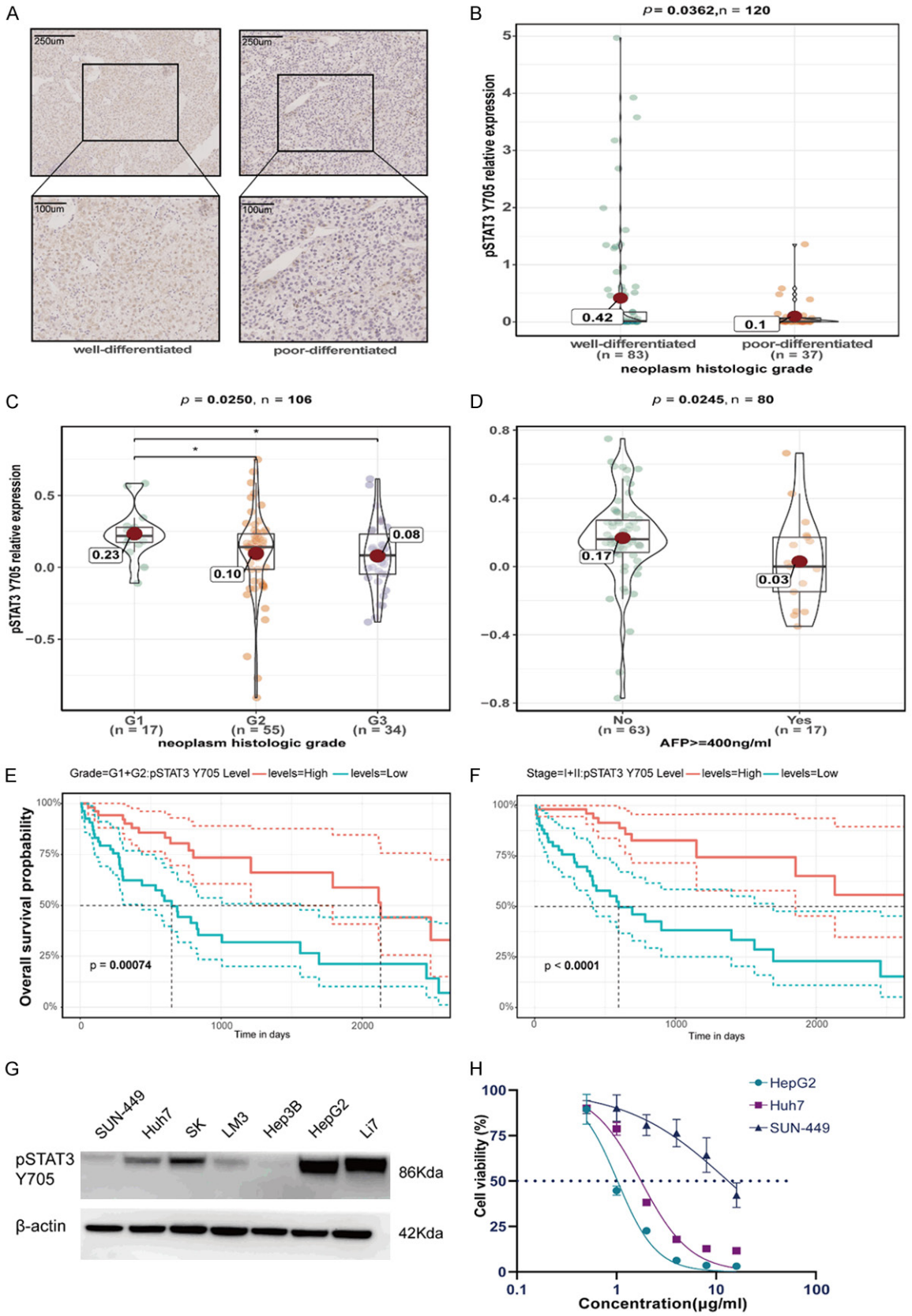

Figure 5. Clinical relevance of pSTAT3 Y705. A. Immunohistochemistry images for the pSTAT3 Y705 in stage I+II well-differentiated and poor-differentiated HCC. The expression of well-differentiated group remarkably exceeds poor-

differentiated group. B. The comparison relative expression pSTAT3 Y705 was showed in violin and box plot. The expression of pSTAT3 Y705 in well-differentiated (G1:5, G2:78) was significantly higher than in poor-differentiated (G3:37). Levels of significance: *P<0.05; (Mann-Whitney test). C, D. Violin and box plots illustrate that pSTAT3 Y705 expression is notably low in the poorly differentiated stage I+II HCC. Similar results were found in AFP <400 ng/ml patients with Stage I+II. Levels of significance: *P<0.05; (Mann-Whitney test). E, F. Kaplan-Meier survival analysis demonstrated that patients with high pSTAT3 Y705 levels had better OS (overall survival) than patients with low expression in Stage I+II and G1+G2. G. Western blotting results revealed the pSTAT3 Y705 expressions in 7 kind of HCC cell lines. H. Curve plot displayed cell viability of 3 group cell lines treated by cryptotanshinone under different concentration for 48 h. The dotted line indicated 50% cell viability position in Y axis.

by exploration of our time-series DEN-induced mouse model.

Many methods, such as implantation, genetic engineering and chemical induction, can be used to induce HCC in mice. Moreover, chemically induced HCC can be divided into DEN-induced, aflatoxin-induced, carbon tetrachloride-induced, and thioacetamide-induced HCC. The hepatocarcinogenesis mechanism of DEN is alkylated DNA oxidative stress generated by the production of reactive oxygen species [14-16]. Oxidative stress is one of the carcinogenesis mechanisms in humans and can be induced by HCC, HCV and HBV [17, 18]. Thus, DEN-induced mouse HCC partially coincides with human HCC in the mechanism of hepatocarcinogenesis. Research on comparative gene expression profiles has demonstrated that HCC from DEN-induced mice approximates a subgroup of human HCC with poor survival [19], and a male-predominant sex ratio is also seen in DEN-induced mouse HCC [20]. In addition to differences in gene expression, DEN-induced mouse HCC carries multiple mutations. The most recent mutation profile investigation revealed that DEN-induced mouse HCC carried more somatic single-nucleotide variants and fewer insertions, deletions or copy number alterations; moreover, the DEN-induced mutational imprint can be computationally rebuilt with six known mutational signatures from the Catalogue of Somatic Mutations in Cancer [21]. As a result, the DEN-induced HCC mouse model can function as a well-simulated model for human HCC research.

Although there has been some research on DEN-induced HCC mouse model, there has not yet been any research about the different stages of HCC in the DEN-induced HCC mouse model. Therefore, we established DEN-induced HCC mouse models covering different stages of disease to explore the mechanisms involved in the progression of HCC. After analysis of the expression profile of every stage, we found that both the quantities and expression patterns of DEGs changed dramatically. This phenomenon demonstrated that the progression from non-metastatic HCC to metastatic HCC may not be gradual and monotonic; instead, a drastic transition appears to occur at a certain point, consistent with a prior report [22]. Subsequently, KEGG pathway enrichment results illustrated that all cascades could be divided into two types: one is directly related to chemical carcinogenesis, and the other is independent from chemical carcinogenesis. After further analysis, it was determined that all pathways connected with chemical carcinogenesis are metabolism pathways. Another interesting finding is that many DEGs (27/49) in these pathways are present in cluster 1 and cluster 3. These results indicated that metabolism disorder was one of the major carcinogenesis events that took place after short-term exposure to DEN. After a detailed analysis of these cascades, it is determined that up-regulation of Pla2g6 could increase the conversion of arachidonic acid from lecithin; therefore, metabolites of arachidonic acid increased as well. Among these metabolites, eicosanoids and 20-hydroxyeicosatetraenoic acid (20-HETE) were reported to play crucial roles in the progression of cancer [23, 24]. Additionally, biosynthesized eicosanoids derived from arachidonic acid were converted to epoxyeicosatrienoic acid (EET) via the cytochrome P450 pathway, and EET could activate peroxisome-proliferator activating receptors (Ppars) [25]. In the Ppars family, we determined that Pparγ was enriched in the PPAR signaling pathway and that the PPAR pathways were not connected with chemical carcinogenesis. For this reason, the PPAR cascade may be regulated by chemical carcinogenesis with EET. Furthermore, Pparγ is capable of affecting both mitochondrial and lipid metabolism, contributing to the initiation and/or progression of HCC, suggesting the disruption of a link in the PPAR pathway

[26]. In steroid hormone biosynthesis, we found that some genes of the Hsd family (Hsd17b2, Hsd17b6, Hsd17b7, Hsd3b2, Hsd3b5) that are involved in testosterone biosynthesis were up-regulated. As a result, testosterone was reported as a risk factor in HCC [27] and may increase with the expression of the Hsd family. Interestingly, Hsd3b5, a member of the Hsd family, was identified as a major connector in the PPI network. Most proteins connected with Hsd3b5 were metabolism-related and were significantly enriched in 3 metabolism biological processes. These lines of evidence suggest that Hsd3b5 probably plays a critical role in metabolism-related hepatocarcinogenesis. To further clarify the hepatocarcinogenesis of DEN, further experimental investigations are needed that focus on not only the transcriptome, but also metabolomics.

Apart from the above-mentioned metabolism-related carcinogenic factors, Stat3 was proved to be a crucial factor for carcinogenesis in DEN-induced mouse HCC. Despite the reported importance of Stat3 [7], its phosphorylation and isoforms have not been thoroughly researched in different stages of HCC. After analysis of the phosphorylation of STAT3, no pStat3 Y705 was expressed in normal liver, and expression of pStat3 Y705 fluctuated during HCC progression. In contrast, pStat3 S727 was expressed at relatively stable levels in 4 of 5 groups; thus, it can be inferred that pSTAT3 S727, pSTAT3 Y705 is more suitable as a biomarker. In addition to its different phosphorylation states, current evidence indicates that there are two most common isoforms of STAT3: full-length STAT3-alpha and truncated STAT3-beta. Distinctively, STAT3-beta has no serine phosphorylation site within the carboxy-terminal transcriptional activation domain (TAD) [28]. The truncated STAT3-beta is generated by the alternative splicing of acceptor sites embedded in exon 23 [29]. Activation of the two isoforms is associated with the phosphorylation of STAT3 at tyrosine 705 (pSTAT3 Y705). STAT3-alpha exhibits stronger transcriptional activity, whereas STAT3-beta displays more robust DNA-binding activity [30]. Accordingly, STAT3-alpha is widely regarded as a carcinogen, while STAT3-beta has obtained attention as a potential tumor inhibitor [31]. Recent research on breast cancer and esophageal squamous-cell carcinoma demonstrated that STAT3-beta played an important role in suppressing cancer cells [32, 33]. In our study, Stat3-beta (79 kDa) was undetectable in the NC group, whereas it was over-expressed in the 15th week; however, Stat3-beta was down-regulated from the 28th to 30th weeks, with re-emergence of Stat3-alpha, as shown by our WB results. The mechanism for this change may involve the reported negative regulation of tyrosine 705 phosphorylation by serine 727 phosphorylation [34]. Interestingly, STAT3-beta changed again in the metastasis stage; however, the implicit mechanism of this change remains to be explored. When both phosphorylation and isoforms of STAT3 were included in the analysis, we found that expression of the beta isoform of pStat3 Y705 was down-regulated from the 15th to the 28th week and was increased from the 30th to the 42nd week and that expression of the alpha isoform of pStat3 Y705 was up-regulated from the 30th to the 42nd week. These results indicated that level of pSTAT3 Y705 represented STAT3-beta only in the early stage of HCC. According to the above-mentioned analytical results, the reason for the decreased prognostic capacity of pSTAT3 Y705 in G3+G4 and stage III+IV is the interference of STAT3-alpha. Currently, it has been demonstrated that pSTAT3 S727 acted as a carcinogenic factor in DEN-induced mouse HCC [35]. Another research suggested that pSTAT3 Y705 was a promoting factor in DEN-induced mouse HCC [36]. However, the author of that study only considered pSTAT3 Y705 as an activated marker of STAT3 and ignored the different roles of the two isoforms of STAT3; thus, they could not conclude that STAT3-beta is an oncogenic factor in DEN-induced mouse HCC.

Conclusion

In this research, we first constructed a time-series DEN-induced mouse HCC model covering the exposure, precancerous, carcinogenesis and metastasis stages of disease. By exploring the gene expression profiles of the model, crucial transcription factors and proteins were identified. In hub nodes, we found that pSTAT3 Y705 functions as a prognostic biomarker in early-stage HCC.

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Disclosure of conflict of interest

None.

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References

[1] Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA and Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018; 68: 394-424.

[2] Llovet JM, Zucman-Rossi J, Pikarsky E, Sangro B, Schwartz M, Sherman M and Gores G. Hepatocellular carcinoma. Nat Rev Dis Primers 2016; 2: 16018.

[3] Fujiwara N, Friedman SL, Goossens N and Hoshida Y. Risk factors and prevention of hepatocellular carcinoma in the era of precision medicine. J Hepatol 2018; 68: 526-549.

[4] He L, Tian DA, Li PY and He XX. Mouse models of liver cancer: progress and recommendations. Oncotarget 2015; 6: 23306-23322.

[5] Aravalli RN, Cressman EN and Steer CJ. Cellular and molecular mechanisms of hepatocellular carcinoma: an update. Arch Toxicol 2013; 87: 227-247.

[6] Chambers AF, Groom AC and MacDonald IC. Dissemination and growth of cancer cells in metastatic sites. Nat Rev Cancer 2002; 2: 563-572.

[7] He G and Karin M. NF-kappaB and STAT3-key players in liver inflammation and cancer. Cell Res 2011; 21: 159-168.

[8] Xu QG, Yuan SX, Tao QF, Yu J, Cai J, Yang Y, Guo XG, Lin KY, Ma JZ, Dai DS, Wang ZG, Gu FM, Zhao LH, Li LQ, Liu JF, Sun SH, Zang YJ, Liu H, Yang F and Zhou WP. A novel HBx genotype serves as a preoperative predictor and fails to activate the JAK1/STATs pathway in hepatocellular carcinoma. J Hepatol 2019; 70: 904-917.

[9] Hu H, Miao YR, Jia LH, Yu QY, Zhang Q and Guo AY. AnimalTFDB 3.0: a comprehensive resource for annotation and prediction of animal transcription factors. Nucleic Acids Res 2019; 47: D33-D38.

[10] Yu G, Wang LG, Han Y and He QY. clusterProfiler: an R package for comparing biological themes among gene clusters. OMICS 2012; 16: 284-287.

[11] Shannon P, Markiel A, Ozier O, Baliga NS, Wang JT, Ramage D, Amin N, Schwikowski B and Ideker T. Cytoscape: a software environment for integrated models of biomolecular interaction networks. Genome Res 2003; 13: 2498-2504.

[12] Nazarieh M, Wiese A, Will T, Hamed M and Helms V. Identification of key player genes in gene regulatory networks. BMC Syst Biol 2016; 10: 88.

[13] Liu W, Xie Y, Ma J, Luo X, Nie P, Zuo Z, Lahrmann U, Zhao Q, Zheng Y, Zhao Y, Xue Y and Ren J. IBS: an illustrator for the presentation and visualization of biological sequences. Bioinformatics 2015; 31: 3359-3361.

[14] Verna L, Whysner J and Williams GM. N-nitrosodiethylamine mechanistic data and risk assessment: bioactivation, DNA-adduct formation, mutagenicity, and tumor initiation. Pharmacol Ther 1996; 71: 57-81.

[15] Kawanishi S, Hiraku Y, Murata M and Oikawa S. The role of metals in site-specific DNA damage with reference to carcinogenesis. Free Radic Biol Med 2002; 32: 822-832.

[16] Valko M, Rhodes CJ, Moncol J, Izakovic M and Mazur M. Free radicals, metals and antioxidants in oxidative stress-induced cancer. Chem Biol Interact 2006; 160: 1-40.

[17] Bartosch B, Thimme R, Blum HE and Zoulim F. Hepatitis C virus-induced hepatocarcinogenesis. J Hepatol 2009; 51: 810-820.

[18] Ivanov AV, Bartosch B, Smirnova OA, Isaguliants MG and Kochetkov SN. HCV and oxidative stress in the liver. Viruses 2013; 5: 439-469.

[19] Lee JS, Chu IS, Mikaelyan A, Calvisi DF, Heo J, Reddy JK and Thorgeirsson SS. Application of comparative functional genomics to identify best-fit mouse models to study human cancer. Nat Genet 2004; 36: 1306-1311.

[20] Goldfarb S, Pugh TD, Kosciuk S and Chover J. Kinetics of diethylnitrosamine hepatocarcinogenesis in the infant mouse. Cancer Res 1985; 45: 909-912.

[21] Connor F, Rayner TF, Aitken SJ, Feig C, Lukk M, Santoyo-Lopez J and Odom DT. Mutational landscape of a chemically-induced mouse model of liver cancer. J Hepatol 2018; 69: 840-850.

[22] Yang B, Li M, Tang W, Liu W, Zhang S, Chen L and Xia J. Dynamic network biomarker indicates pulmonary metastasis at the tip-

ping point of hepatocellular carcinoma. Nat Commun 2018; 9: 678.
[23] Johnson AL, Edson KZ, Totah RA and Rettie AE. Cytochrome P450 omega-hydroxylases in inflammation and cancer. Adv Pharmacol 2015; 74: 223-262.
[24] Chiurchiu V, Leuti A and Maccarrone M. Bioactive lipids and chronic inflammation: managing the fire within. Front Immunol 2018; 9: 38.
[25] Dennis EA and Norris PC. Eicosanoid storm in infection and inflammation. Nat Rev Immunol 2015; 15: 511-523.
[26] Piccinin E, Villani G and Moschetta A. Metabolic aspects in NAFLD, NASH and hepatocellular carcinoma: the role of PGC1 coactivators. Nat Rev Gastroenterol Hepatol 2019; 16: 160-174.
[27] Yu MW and Chen CJ. Elevated serum testosterone levels and risk of hepatocellular carcinoma. Cancer Res 1993; 53: 790-794.
[28] Wen Z, Zhong Z and Darnell JE Jr. Maximal activation of transcription by Stat1 and Stat3 requires both tyrosine and serine phosphorylation. Cell 1995; 82: 241-250.
[29] Shao H, Quintero AJ and Tweardy DJ. Identification and characterization of cis elements in the STAT3 gene regulating STAT3 alpha and STAT3 beta messenger RNA splicing. Blood 2001; 98: 3853-3856.
[30] Schaefer TS, Sanders LK, Park OK and Nathans D. Functional differences between Stat3alpha and Stat3beta. Mol Cell Biol 1997; 17: 5307-5316.
[31] Aigner P, Just V and Stoiber D. STAT3 isoforms: alternative fates in cancer? Cytokine 2019; 118: 27-34.
[32] Zammarchi F, de Stanchina E, Bournazou E, Supakorndej T, Martires K, Riedel E, Corben AD, Bromberg JF and Cartegni L. Antitumorigenic potential of STAT3 alternative splicing modulation. Proc Natl Acad Sci U S A 2011; 108: 17779-17784.
[33] Zhang HF, Chen Y, Wu C, Wu ZY, Tweardy DJ, Alshareef A, Liao LD, Xue YJ, Wu JY, Chen B, Xu XE, Gopal K, Gupta N, Li EM, Xu LY and Lai R. The opposing function of STAT3 as an oncoprotein and tumor suppressor is dictated by the expression status of STAT3beta in esophageal squamous cell carcinoma. Clin Cancer Res 2016; 22: 691-703.
[34] Chung J, Uchida E, Grammer TC and Blenis J. STAT3 serine phosphorylation by ERK-dependent and -independent pathways negatively modulates its tyrosine phosphorylation. Mol Cell Biol 1997; 17: 6508-6516.
[35] Miyakoshi M, Yamamoto M, Tanaka H and Ogawa K. Serine 727 phosphorylation of STAT3: an early change in mouse hepatocarcinogenesis induced by neonatal treatment with diethylnitrosamine. Mol Carcinog 2014; 53: 67-76.
[36] Won C, Kim BH, Yi EH, Choi KJ, Kim EK, Jeong JM, Lee JH, Jang JJ, Yoon JH, Jeong WI, Park IC, Kim TW, Bae SS, Factor VM, Ma S, Thorgeirsson SS, Lee YH and Ye SK. Signal transducer and activator of transcription 3-mediated CD133 up-regulation contributes to promotion of hepatocellular carcinoma. Hepatology 2015; 62: 1160-1173.

Supplementary Table 1. All primer were used in RT-PCR experiment

Name	Sequence
Mus-Socs2 (primer forward)	GCTCAGTCAAACAGGATGGTA
Mus-Socs2 (primer reverse)	AGTAGGTAGTCTGAATGCGAAC
Mus-Socs3 (primer forward)	GTCACCCACAGCAAGTTTCC
Mus-Socs3 (primer reverse)	CGCTCCAGTAGAATCCGCTC
Mus-Pim1 (primer forward)	TCTACACGGACTTTGATGGGAC
Mus-Pim1 (primer reverse)	AGTTTGCCTGAAGAACACTTGG
Mus-Stat3 (primer forward)	GGAGAAGCATTGTGAGTGAGC
Mus-Stat3 (primer reverse)	GTTATCCAGTTTTCCAGACGGT
Mus-Ccnd1 (primer forward)	TGAGAACAAGCAGACCATCC
Mus-Ccnd1 (primer reverse)	CGGTAGCAGGAGAGGAAGTT
Mus-Aox1 (primer forward)	CCTGGATGAGTCACTATGGGT
Mus-Aox1 (primer reverse)	GTGTTGGATGGAAGGTTGGT
Mus-Aox3 (primer forward)	CACTACTCGGGAAATACAAGAT
Mus-Aox3 (primer reverse)	CTATCACCAGTTCAGAATCATC

Supplementary Table 2. Log_2 fold change, adjusted *p*-value and cluster results of all differentially expressed genes between DEN-treated and NC group

SYMBOL	log_2FC.15w	log_2FC.28w	log_2FC.30w	log_2FC.42w	adj.*P* value.15w	adj.*P* value.28w	adj.*P* value.30w	adj.*P* value.42w	max log_2FC	clusters	42w Regualted
1600002H07Rik	0.442	-0.325	-0.769	-1.997	5.14E-01	4.93E-01	1.11E-01	3.50E-04	-1.997	42wOnly	Under
1700029I15Rik	-0.277	-1.098	-1.177	-0.154	7.12E-01	2.67E-02	1.61E-02	7.35E-01	-1.177	4	Normal
2010003K11Rik	0.366	0.487	0.823	1.274	6.16E-01	3.14E-01	9.38E-02	1.11E-02	1.274	42wOnly	Over
2200002D01Rik	0.537	1.224	1.502	1.493	4.51E-02	1.86E-05	1.67E-06	3.06E-06	1.502	2	Over
2410002F23Rik	0.247	1.222	0.832	0.541	2.94E-01	5.49E-06	1.67E-04	5.21E-03	1.222	2	Normal
2410089E03Rik	0.06	1.149	1.021	0.36	9.15E-01	3.33E-04	7.74E-04	1.67E-01	1.149	2	Normal
2510019K15Rik	-0.154	-1.476	-0.496	-1.561	8.51E-01	2.21E-03	2.33E-01	9.64E-04	-1.561	4	Under
2610305D13Rik	0.636	1.255	1.675	0.978	1.33E-01	1.51E-03	7.30E-05	6.30E-03	1.675	1	Normal
3110043021Rik	0.818	0.139	1.169	0.414	5.88E-02	6.95E-01	2.90E-03	2.33E-01	1.169	1	Normal
3110082I17Rik	0.544	1.056	0.728	0.572	1.48E-01	2.22E-03	2.21E-02	5.89E-02	1.056	1	Normal
4632427E13Rik	-1.054	-1.069	-0.516	-1.13	5.46E-03	2.05E-03	9.18E-02	8.92E-04	-1.13	3	Under
4833417J20Rik	-0.158	-0.37	-0.786	-1.199	8.26E-01	3.29E-01	4.56E-02	3.33E-03	-1.199	42wOnly	Under
4930581F22Rik	-1.032	-0.527	-0.621	-0.671	4.00E-03	7.88E-02	3.63E-02	2.12E-02	-1.032	3	Normal
5330406M23Rik	-0.51	-0.806	-0.656	-1.267	2.52E-01	3.19E-02	6.61E-02	1.15E-03	-1.267	42wOnly	Under
5730414N17Rik	-0.716	-0.186	-0.415	-1.35	9.55E-02	5.90E-01	2.26E-01	6.10E-04	-1.35	42wOnly	Under
6030422H21Rik	-1.015	-2.145	-2.296	-1.902	3.16E-01	1.27E-02	6.97E-03	1.72E-02	-2.296	4	Under
6330416G13Rik	0.041	0.995	0.665	1.35	9.60E-01	1.12E-02	6.67E-02	7.74E-04	1.35	42wOnly	Over
9030619P08Rik	-4.729	-2.616	-3.731	-2.444	1.87E-04	1.02E-02	5.18E-04	1.06E-02	-4.729	3	Under
9130221J18Rik	1.696	-0.102	1.82	0.903	1.94E-02	8.64E-01	4.81E-03	1.21E-01	1.82	1	Normal
9530053H05Rik	0.137	1.843	1.811	2.01	8.93E-01	1.60E-03	1.53E-03	4.90E-04	2.01	2	Over
A1cf	-0.114	-0.561	-0.987	-1.752	8.66E-01	1.14E-01	7.75E-03	5.77E-05	-1.752	42wOnly	Under
A930033H14Rik	-1.42	-0.71	-1.428	-0.945	3.50E-02	1.99E-01	1.39E-02	8.17E-02	-1.428	3	Normal
Abca3	-0.888	-1.579	-1.501	-0.986	4.51E-02	3.04E-04	3.80E-04	8.48E-03	-1.579	4	Normal
Abcb1a	-1.65	-1.162	-1.143	1.486	2.49E-02	6.41E-02	6.11E-02	1.51E-02	-1.65	3	Over
Abcc1	0.068	0.53	0.203	1.591	9.23E-01	1.18E-01	5.30E-01	9.19E-05	1.591	42wOnly	Over
Abcd2	-3.169	-2.732	-3.791	-2.852	4.81E-04	6.95E-04	1.94E-05	3.31E-04	-3.791	3	Under
Abcg1	0.129	0.448	0.411	1.288	7.87E-01	1.00E-01	1.18E-01	8.17E-05	1.288	42wOnly	Over
Abcg2	1.294	1.199	1.216	1.029	8.18E-04	6.47E-04	4.54E-04	1.60E-03	1.294	1	Over
Abhd10	0.27	1.015	0.741	1.098	3.59E-01	1.95E-04	2.92E-03	8.17E-05	1.098	2	Over
Abhd2	-1.402	-1.414	-1.357	0.047	3.60E-04	9.70E-05	1.26E-04	8.70E-01	-1.414	3	Normal
Ablim3	0.164	-1.363	-0.924	-1.272	8.51E-01	6.30E-03	4.57E-02	6.92E-03	-1.363	4	Under
Acnat2	-2.423	-2.208	-2.329	-1.364	1.01E-03	1.00E-03	4.73E-04	1.90E-02	-2.423	3	Under

Acot1	-0.168	-2.44	-2.509	-2.285	8.67E-01	1.47E-04	8.89E-05	2.31E-04	-2.509	4	Under
Acot2	-0.994	-1.649	-2.056	-1.398	1.34E-01	5.72E-03	8.04E-04	1.12E-02	-2.056	4	Under
Acot3	-3.592	-5.088	-6.804	-3.499	3.74E-03	5.06E-05	1.67E-06	1.37E-03	-6.804	4	Under
Acot4	-1.38	-2.044	-2.82	-1.711	2.49E-02	5.95E-04	1.66E-05	1.76E-03	-2.82	4	Under
Acpp	-0.671	1.587	2.166	0.791	3.59E-01	9.20E-03	6.78E-04	1.47E-01	2.166	2	Normal
Acsl1	0.104	-0.308	-0.788	-1.355	9.13E-01	4.85E-01	8.31E-02	4.37E-03	-1.355	42wOnly	Under
Adamdec1	-1.103	0.248	-0.899	1.383	1.06E-01	6.54E-01	1.05E-01	1.42E-02	1.383	42wOnly	Over
Adgrv1	0.76	1.551	1.301	1.594	2.54E-01	7.61E-03	1.91E-02	4.23E-03	1.594	2	Over
Adh4	-0.055	0.751	1.082	-0.045	9.32E-01	1.82E-02	1.15E-03	8.76E-01	1.082	2	Normal
Adipor2	-0.355	-0.449	-0.616	-1.277	2.68E-01	8.70E-02	2.03E-02	5.95E-05	-1.277	42wOnly	Under
Adk	-0.685	-1.231	-1.49	-1.831	1.10E-01	1.88E-03	2.81E-04	4.51E-05	-1.831	4	Under
Adora1	0.64	1.573	0.519	1.72	7.09E-02	2.68E-05	7.67E-02	1.40E-05	1.72	1	Over
Aen	0.359	1.013	1.096	0.911	4.26E-01	6.24E-03	3.08E-03	8.63E-03	1.096	2	Normal
Afm	-0.429	-0.478	-0.49	-1.022	2.94E-01	1.45E-01	1.26E-01	2.99E-03	-1.022	42wOnly	Under
Afp	0.676	1.094	2.283	3.169	7.17E-01	3.35E-01	5.18E-02	7.97E-03	3.169	42wOnly	Over
Agxt	-0.745	-0.702	-0.483	-1.69	1.50E-01	1.04E-01	2.39E-01	4.20E-04	-1.69	42wOnly	Under
Ahctf1	-0.053	-1.028	-0.538	-0.407	9.23E-01	6.05E-04	3.92E-02	1.04E-01	-1.028	4	Normal
AI132709	-5.541	-5.515	-5.62	-3.444	1.56E-04	2.72E-05	1.94E-05	1.86E-03	-5.62	3	Under
AI467606	0.098	0.876	0.859	1.587	9.01E-01	3.56E-02	3.41E-02	4.20E-04	1.587	42wOnly	Over
AI662270	0.165	0.798	0.914	1.585	8.65E-01	1.09E-01	6.25E-02	2.33E-03	1.585	42wOnly	Over
Akr1b7	-1.514	-1.404	-1.514	1.092	5.88E-02	4.14E-02	2.60E-02	8.96E-02	-1.514	3	Normal
Akr1c20	-0.199	-1.126	-0.587	-1.586	8.15E-01	2.07E-02	1.88E-01	1.37E-03	-1.586	4	Under
Alas1	-0.659	-0.724	-1.305	-1.18	3.95E-01	2.18E-01	3.05E-02	4.28E-02	-1.305	3	Under
Alas2	2.845	3.366	3.505	2.164	1.66E-04	7.65E-06	3.88E-06	5.01E-04	3.505	1	Over
Aldh1b1	-1.291	-0.291	-0.531	0.224	4.06E-03	4.12E-01	1.40E-01	5.30E-01	-1.291	3	Normal
Alox5ap	0.137	0.968	0.657	2.052	8.67E-01	3.43E-02	1.26E-01	9.90E-05	2.052	42wOnly	Over
Amdhd1	-0.539	-0.78	-0.412	-1.379	1.08E-01	8.81E-03	1.27E-01	5.77E-05	-1.379	42wOnly	Under
Amigo2	-0.888	-0.827	-0.874	-1.005	9.04E-03	6.48E-03	3.81E-03	1.01E-03	-1.005	42wOnly	Under
Angptl4	0.036	-1.513	-1.528	-2.264	9.79E-01	4.88E-02	4.21E-02	3.58E-03	-2.264	4	Under
Angptl6	-0.392	-0.603	-0.937	-1.012	1.24E-01	7.90E-03	1.53E-04	8.03E-05	-1.012	42wOnly	Under
Anxa2	0.167	0.284	0.484	2.156	8.47E-01	5.20E-01	2.72E-01	9.48E-05	2.156	42wOnly	Over
Aox1	1.03	0.712	0.991	0.344	8.02E-03	3.36E-02	4.01E-03	2.64E-01	1.03	1	Normal
Aox3	0.967	1.237	1.254	0.188	3.90E-02	3.78E-03	3.01E-03	6.16E-01	1.254	1	Normal
Apcs	-0.739	0.184	1.155	0.918	1.50E-01	6.58E-01	9.30E-03	2.78E-02	1.155	2	Normal
Apob	-0.393	-0.704	-0.562	-1.262	1.49E-01	4.18E-03	1.58E-02	1.87E-05	-1.262	42wOnly	Under
Aqp4	1.01	2.948	2.084	1.265	2.52E-01	4.05E-04	5.88E-03	6.82E-02	2.948	2	Normal

Ar	-1.612	-0.918	-1.26	-0.748	1.50E-03	3.14E-02	3.97E-03	6.00E-02	-1.612	3	Normal
Arhgap30	0.066	1.092	0.686	1.596	9.36E-01	1.26E-02	8.82E-02	4.61E-04	1.596	2	Over
Arhgef10	0.033	1.183	2.013	0.83	9.60E-01	1.67E-03	5.28E-06	1.29E-02	2.013	2	Normal
Arid4b	-0.192	-0.62	-0.741	-1.209	6.81E-01	4.77E-02	1.83E-02	3.97E-04	-1.209	42wOnly	Under
Arl2bp	0.077	0.633	0.521	1.515	9.36E-01	1.84E-01	2.57E-01	2.62E-03	1.515	42wOnly	Over
Arl4c	0.019	0.364	0.213	1.067	9.71E-01	1.79E-01	4.13E-01	4.55E-04	1.067	42wOnly	Over
Arl4d	-0.66	-0.788	-0.881	-1.208	2.65E-01	1.03E-01	6.33E-02	1.16E-02	-1.208	42wOnly	Under
Arl5b	-0.336	-0.759	-1.013	-1.186	2.79E-01	5.60E-03	4.09E-04	9.19E-05	-1.186	4	Under
Armcx4	-0.227	0.96	0.477	3.261	8.26E-01	8.93E-02	3.69E-01	1.29E-05	3.261	42wOnly	Over
Arrdc4	-0.68	-1.649	-1.312	-0.816	7.57E-02	3.46E-05	3.46E-04	1.10E-02	-1.649	4	Normal
Arsa	1.05	1.38	0.992	0.935	2.56E-02	1.76E-03	1.47E-02	1.66E-02	1.38	1	Normal
Asns	2.725	3.107	2.573	2.927	1.68E-02	3.05E-03	9.87E-03	3.25E-03	3.107	1	Over
Atg16l2	1.626	1.37	1.734	1.228	8.91E-04	1.67E-03	1.44E-04	2.54E-03	1.734	1	Over
Atp11a	-0.167	-0.157	1.828	1.648	8.88E-01	7.93E-01	4.69E-03	7.50E-03	1.828	1	Over
Atp2a2	0.03	-1.273	-0.155	-0.714	9.60E-01	1.45E-04	5.59E-01	1.09E-02	-1.273	4	Normal
Atp2b2	-0.742	-1.062	-0.976	-0.699	5.77E-02	2.97E-03	4.81E-03	2.85E-02	-1.062	3	Normal
Atp6v0d2	-3.825	-3.201	-4.601	-2.7	1.06E-03	2.08E-03	4.98E-05	4.95E-03	-4.601	3	Under
Atp8b4	0.786	1.454	1.63	1.302	1.03E-01	1.28E-03	3.59E-04	2.03E-03	1.63	2	Over
Atrx	-0.528	-0.373	-0.455	-1.08	1.23E-02	4.00E-02	1.26E-02	8.29E-06	-1.08	42wOnly	Under
B230114P17Rik	-1.567	-1.506	-1.749	-2.076	1.03E-01	6.39E-02	3.01E-02	9.64E-03	-2.076	3	Under
Bach2	-1.183	-0.616	-0.087	-0.936	1.53E-02	1.31E-01	8.19E-01	2.00E-02	-1.183	3	Normal
Bbox1	-0.158	-0.051	-0.544	-1.052	7.78E-01	8.71E-01	8.50E-02	1.95E-03	-1.052	42wOnly	Under
BC024139	-0.694	-0.371	-1.009	-1.28	5.88E-02	2.19E-01	2.52E-03	2.66E-04	-1.28	3	Under
BC029214	-1.311	-1.655	-1.165	-1.12	6.95E-03	4.05E-04	6.08E-03	6.23E-03	-1.655	3	Under
BC048546	1.142	1.151	1.658	1.593	6.95E-03	2.80E-03	7.80E-05	1.17E-04	1.658	1	Over
BC089597	-1.227	-1.183	-1.564	-2.054	9.48E-02	5.83E-02	1.35E-02	1.60E-03	-2.054	3	Under
Bche	-0.996	-1.061	-1.656	-0.732	1.23E-02	3.50E-03	4.41E-05	2.49E-02	-1.656	3	Normal
Bmp2	-0.29	-0.375	-0.463	-1.05	4.56E-01	1.99E-01	1.09E-01	1.06E-03	-1.05	42wOnly	Under
Bok	1.005	0.615	1.053	0.897	2.97E-03	3.22E-02	6.56E-04	2.06E-03	1.053	1	Normal
Bptf	-0.543	-0.537	-0.581	-1.201	8.41E-02	4.68E-02	2.90E-02	1.14E-04	-1.201	42wOnly	Under
Btbd11	1.225	0.881	0.859	0.577	4.80E-02	9.23E-02	9.13E-02	2.46E-01	1.225	1	Normal
Btnl9	0.079	-3.987	-3.771	-2.06	9.59E-01	8.64E-06	1.31E-05	3.31E-03	-3.987	4	Under
C6	3.907	4.086	4.335	2.615	1.66E-04	2.73E-05	1.31E-05	1.56E-03	4.335	1	Over
C8a	1.567	1.688	2.252	0.229	5.21E-02	1.77E-02	2.23E-03	7.25E-01	2.252	1	Normal
C8b	1.352	1.331	1.478	-0.06	1.58E-02	8.20E-03	3.39E-03	8.91E-01	1.478	1	Normal
C9	1.283	1.256	1.777	0.971	3.39E-03	1.76E-03	4.60E-05	7.64E-03	1.777	1	Normal

Camk2b	0.083	1.617	1.311	0.623	8.88E-01	2.14E-05	1.81E-04	3.37E-02	1.617	2	Normal
Camkk2	-1.158	-1.284	-1.391	-0.547	1.68E-04	1.55E-05	5.23E-06	1.68E-02	-1.391	3	Normal
Car2	-0.932	-1.107	-1.718	0.01	1.31E-01	3.63E-02	2.15E-03	9.82E-01	-1.718	3	Normal
Car8	-0.209	-0.583	-0.497	-1.077	6.77E-01	7.88E-02	1.18E-01	1.87E-03	-1.077	42wOnly	Under
Casp4	0.428	0.633	0.698	2.558	5.58E-01	2.19E-01	1.68E-01	6.49E-05	2.558	42wOnly	Over
Cav1	0.684	1.99	2.118	1.985	2.36E-01	3.15E-04	1.27E-04	2.36E-04	2.118	2	Over
Cbr3	0.335	1.065	1.715	3.148	7.57E-01	1.03E-01	1.07E-02	6.76E-05	3.148	2	Over
Cbs	-0.333	-0.532	-0.362	-1.766	5.23E-01	1.57E-01	3.15E-01	9.84E-05	-1.766	42wOnly	Under
Ccdc80	-0.23	-0.075	-0.47	1.001	5.80E-01	7.96E-01	1.01E-01	1.40E-03	1.001	42wOnly	Over
Ccl5	-0.279	1.785	1.133	2.271	7.07E-01	9.11E-04	1.93E-02	7.68E-05	2.271	2	Over
Ccl6	0.299	0.426	0.501	1.704	7.00E-01	3.71E-01	2.90E-01	1.39E-03	1.704	42wOnly	Over
Ccnd1	-3.008	-2.182	-2.711	-2.188	1.97E-06	1.82E-05	1.45E-06	2.26E-05	-3.008	3	Under
Ccng1	0.175	0.949	1.069	0.712	6.77E-01	1.96E-03	5.61E-04	1.01E-02	1.069	2	Normal
Cct4	-0.078	-1.052	-0.584	-1.178	8.94E-01	1.99E-03	5.46E-02	5.04E-04	-1.178	4	Under
Cd163	0.061	-0.857	-1.319	-2.486	9.60E-01	1.54E-01	3.10E-02	3.04E-04	-2.486	4	Under
Cd24a	-0.395	0.108	-0.749	2.364	6.75E-01	8.59E-01	2.05E-01	5.23E-04	2.364	42wOnly	Over
Cd5l	-0.14	0.776	0.602	1.103	8.67E-01	8.44E-02	1.62E-01	1.27E-02	1.103	42wOnly	Over
Cd84	-0.509	1.025	0.442	1.178	2.30E-01	5.97E-03	1.84E-01	1.40E-03	1.178	2	Over
Cdc42ep5	1.662	0.327	1.607	1.303	7.01E-04	3.74E-01	2.86E-04	1.51E-03	1.662	1	Over
Cdh1	0.223	-1.93	-1.365	-0.054	7.12E-01	4.64E-05	1.26E-03	8.82E-01	-1.93	4	Normal
Cdkn2c	-0.906	0.739	-0.072	1.053	1.68E-02	2.61E-02	8.08E-01	1.78E-03	1.053	42wOnly	Over
Cdt1	-0.195	1.422	0.736	1.527	7.47E-01	6.56E-04	4.38E-02	2.57E-04	1.527	2	Over
Ceacam1	-0.101	-0.239	-0.388	-1.306	8.26E-01	3.24E-01	1.12E-01	4.17E-05	-1.306	42wOnly	Under
Cela1	0.391	1.142	1.008	0.153	3.82E-01	2.79E-03	6.06E-03	6.46E-01	1.142	2	Normal
Cep44	0.076	-2.394	-2.455	-1.663	9.20E-01	4.58E-06	1.42E-06	1.01E-04	-2.455	4	Under
Cers6	-0.806	-1.003	-0.473	0.104	2.18E-02	2.08E-03	9.99E-02	7.14E-01	-1.003	3	Normal
Cfhr2	0.19	-0.429	-0.31	-1.011	6.99E-01	1.69E-01	2.99E-01	2.25E-03	-1.011	42wOnly	Under
Cflar	-0.066	-0.557	-0.732	-1.103	8.81E-01	2.12E-02	3.12E-03	7.85E-05	-1.103	42wOnly	Under
Chic1	-2.607	-2.908	-2.94	-2.903	1.56E-04	8.64E-06	5.52E-06	1.29E-05	-2.94	3	Under
Chordc1	-0.233	-1.423	-0.997	-0.832	4.55E-01	7.65E-06	2.80E-04	1.18E-03	-1.423	4	Normal
Chp1	-0.186	-0.228	-0.665	-1.059	6.98E-01	4.33E-01	3.10E-02	1.28E-03	-1.059	42wOnly	Under
Chpt1	0.811	0.871	1.004	0.59	5.81E-03	1.42E-03	3.12E-04	1.44E-02	1.004	1	Normal
Ciapin1	0.093	1.274	1.021	1.002	8.15E-01	9.34E-06	9.20E-05	1.16E-04	1.274	2	Over
Cib3	1.437	1.932	1.796	1.649	5.55E-02	4.55E-03	6.56E-03	9.01E-03	1.932	1	Over
Cidea	0.129	2.22	3.493	2.438	9.57E-01	3.68E-02	1.96E-03	1.68E-02	3.493	2	Over
Cidec	1.136	1.297	1.313	2.355	2.58E-01	1.13E-01	9.93E-02	4.82E-03	2.355	42wOnly	Over

Cirbp	0.113	2.712	1.993	1.612	8.94E-01	7.60E-06	1.38E-04	8.81E-04	2.712	2	Over
Clca3a1	-0.2	0.466	0.491	2.116	7.73E-01	2.38E-01	2.04E-01	4.01E-05	2.116	42wOnly	Over
Clcf1	0.038	0.588	0.469	2.014	9.60E-01	1.32E-01	2.11E-01	4.51E-05	2.014	42wOnly	Over
Clec2h	-0.004	3.595	2.213	1.465	9.98E-01	2.18E-03	3.71E-02	1.48E-01	3.595	2	Normal
Clec4a3	-0.678	0.308	0.017	1.23	2.79E-01	5.27E-01	9.71E-01	1.48E-02	1.23	42wOnly	Over
Clec4n	0.202	1.278	1.022	2.27	8.65E-01	4.56E-02	9.37E-02	8.21E-04	2.27	2	Over
Clec7a	-0.468	0.953	0.785	1.713	3.59E-01	2.29E-02	4.90E-02	2.19E-04	1.713	42wOnly	Over
Clic1	-0.29	0.641	0.154	1.137	4.15E-01	2.36E-02	5.50E-01	2.49E-04	1.137	42wOnly	Over
Clip1	-0.309	-0.281	-1.088	-0.864	3.81E-01	2.90E-01	4.49E-04	2.55E-03	-1.088	3	Normal
Cln8	0.056	-1.009	-0.798	-0.911	9.04E-01	2.49E-04	1.80E-03	4.45E-04	-1.009	4	Normal
Clp1	0.315	0.491	1.065	0.66	3.47E-01	6.62E-02	3.75E-04	1.18E-02	1.065	1	Normal
Cml5	3.621	2.759	3.813	2.194	9.88E-04	3.84E-03	1.84E-04	1.20E-02	3.813	1	Over
Cnst	-0.323	-1.363	-1.351	-0.48	4.46E-01	3.34E-04	2.86E-04	1.22E-01	-1.363	4	Normal
Col27a1	1.755	1.132	0.89	1.013	1.50E-03	1.66E-02	4.57E-02	2.12E-02	1.755	1	Over
Col5a2	-1.12	-0.111	-0.207	1.751	5.88E-02	8.21E-01	6.63E-01	1.08E-03	1.751	42wOnly	Over
Col5a3	1.722	1.563	1.99	0.859	5.29E-05	1.86E-05	1.40E-06	3.73E-03	1.99	1	Normal
Col6a3	0.255	0.506	0.09	1.841	4.50E-01	5.39E-02	7.11E-01	1.17E-06	1.841	42wOnly	Over
Comt	0.614	0.711	1.115	0.786	4.22E-02	8.60E-03	1.63E-04	2.87E-03	1.115	1	Normal
Coro1a	-0.197	1.287	0.968	1.897	8.02E-01	5.50E-03	2.60E-02	1.52E-04	1.897	2	Over
Cpne8	0.657	0.091	0.767	1.141	2.02E-01	8.26E-01	6.57E-02	7.57E-03	1.141	42wOnly	Over
Cpox	-0.308	-0.59	-0.641	-1.487	5.80E-01	1.31E-01	9.48E-02	5.64E-04	-1.487	42wOnly	Under
Creld2	-0.265	-2.236	-0.484	-1.959	8.15E-01	1.17E-03	4.03E-01	2.20E-03	-2.236	4	Under
Crem	0.176	-1.349	-0.322	-0.942	7.42E-01	3.74E-04	2.97E-01	4.65E-03	-1.349	4	Normal
Crip1	0.03	0.49	0.022	2.339	9.62E-01	1.58E-01	9.47E-01	3.06E-06	2.339	42wOnly	Over
Crygn	0.733	1.066	0.903	0.559	2.83E-02	8.34E-04	2.89E-03	4.01E-02	1.066	1	Normal
Csf2ra	0.123	0.493	0.339	1.084	8.07E-01	7.36E-02	1.93E-01	3.67E-04	1.084	42wOnly	Over
Csf2rb	0.472	1.041	0.681	1.25	4.07E-01	2.28E-02	1.09E-01	5.09E-03	1.25	1	Over
Csf2rb2	0.302	0.689	0.524	1.689	4.35E-01	2.61E-02	7.33E-02	1.68E-05	1.689	42wOnly	Over
Csrp3	-0.973	-0.662	-0.587	-1.541	6.39E-02	1.32E-01	1.68E-01	1.17E-03	-1.541	42wOnly	Under
Cstb	-0.007	0.262	0.118	1.031	9.96E-01	4.16E-01	7.11E-01	3.25E-03	1.031	42wOnly	Over
Ctla2a	0.054	0.51	0.547	1.726	9.57E-01	2.37E-01	1.96E-01	4.34E-04	1.726	42wOnly	Over
Ctla2b	-0.092	0.877	0.713	1.047	9.32E-01	8.22E-02	1.40E-01	3.19E-02	1.047	42wOnly	Over
Ctse	0.489	4.018	3.584	1.635	6.15E-01	7.60E-06	1.87E-05	1.33E-02	4.018	2	Over
Ctso	-0.091	-0.654	-0.433	-1.058	8.93E-01	6.31E-02	1.93E-01	3.22E-03	-1.058	42wOnly	Under
Cux2	-3.991	-4.204	-4.292	-2.388	1.57E-04	1.55E-05	1.21E-05	2.62E-03	-4.292	3	Under
Cxadr	0.481	0.828	1.092	1.379	3.46E-01	4.38E-02	8.92E-03	1.32E-03	1.379	1	Over

Cxcl1	3.5	2.638	4.271	2.737	7.97E-04	3.45E-03	2.89E-05	1.75E-03	4.271	1	Over
Cxcl10	0.961	0.845	1.204	1.307	1.49E-01	1.25E-01	3.05E-02	1.66E-02	1.307	1	Over
Cxcl9	-0.036	0.955	1.022	1.407	9.71E-01	7.22E-02	4.93E-02	7.74E-03	1.407	2	Over
Cyb561	0.162	1.44	2.325	2.42	8.65E-01	6.41E-03	7.71E-05	5.95E-05	2.42	2	Over
Cyfip2	-0.016	1.858	2.791	1.924	9.91E-01	1.87E-03	2.87E-05	9.52E-04	2.791	2	Over
Cyp17a1	-3.993	-3.861	-5.508	-2.548	2.17E-03	1.26E-03	2.88E-05	1.53E-02	-5.508	3	Under
Cyp26b1	-1.741	-2.744	-1.94	-2.592	2.01E-02	2.18E-04	3.87E-03	2.88E-04	-2.744	3	Under
Cyp2b10	-1.442	-2.208	-2.216	-2.059	1.62E-01	1.48E-02	1.21E-02	1.50E-02	-2.216	3	Under
Cyp2b13	-7.239	-8.35	-8.058	-5.337	1.66E-04	9.14E-06	1.23E-05	6.59E-04	-8.35	3	Under
Cyp2b9	-7.663	-4.85	-5.02	-3.927	1.08E-04	1.67E-03	9.98E-04	5.23E-03	-7.663	3	Under
Cyp2c37	-1.032	-1.661	-1.711	-1.691	6.84E-02	1.76E-03	1.13E-03	1.03E-03	-1.711	4	Under
Cyp2c38	-1.659	-1.75	-2.172	-1.557	2.56E-02	8.73E-03	1.52E-03	1.22E-02	-2.172	3	Under
Cyp2c39	-2.683	-2.9	-3.274	-1.994	7.27E-04	1.16E-04	2.78E-05	2.41E-03	-3.274	3	Under
Cyp2c55	1.09	0.966	0.825	0.01	4.51E-02	3.98E-02	6.67E-02	9.81E-01	1.09	1	Normal
Cyp2c68	-1.588	-1.974	-2.348	-1.594	8.59E-04	2.90E-05	3.88E-06	2.42E-04	-2.348	3	Under
Cyp2d13	-0.184	-0.285	-0.815	-1.549	8.24E-01	5.07E-01	6.65E-02	1.33E-03	-1.549	42wOnly	Under
Cyp2d9	3.971	4.365	4.26	2.478	1.26E-04	7.65E-06	7.43E-06	1.46E-03	4.365	1	Over
Cyp2g1	-1.142	-0.159	-1.045	-0.394	4.30E-02	7.31E-01	2.90E-02	3.88E-01	-1.142	3	Normal
Cyp2j5	-0.066	-0.616	-0.325	-1.181	9.27E-01	7.69E-02	3.18E-01	1.33E-03	-1.181	42wOnly	Under
Cyp2j9	0.615	1.055	1.107	0.167	2.68E-01	2.49E-02	1.68E-02	7.01E-01	1.107	2	Normal
Cyp2u1	1.166	1.42	1.222	0.051	2.49E-02	2.97E-03	7.59E-03	9.00E-01	1.42	1	Normal
Cyp39a1	-0.516	-1.263	-1.767	-0.789	4.24E-01	1.55E-02	1.14E-03	9.50E-02	-1.767	4	Normal
Cyp4a12a	8.386	9.322	9.944	5.098	1.66E-04	1.14E-05	4.58E-06	2.79E-03	9.944	1	Over
Cyp4a14	-0.797	-1.193	-1.622	-2.229	2.25E-01	3.21E-02	4.42E-03	2.67E-04	-2.229	4	Under
Cyp4a31	-0.333	-2.726	-2.68	-2.807	8.24E-01	2.40E-03	2.49E-03	1.31E-03	-2.807	4	Under
Cyp4f14	-0.412	-0.469	-0.679	-1.208	3.59E-01	1.78E-01	5.19E-02	1.34E-03	-1.208	42wOnly	Under
Cyp7b1	2.575	2.984	3.063	1.266	3.07E-03	3.37E-04	2.03E-04	6.62E-02	3.063	1	Normal
Cyp8b1	0.776	0.726	0.329	-1.933	2.57E-01	1.85E-01	5.33E-01	1.22E-03	-1.933	42wOnly	Under
Cyr61	-1.844	-0.011	-1.54	-0.988	3.53E-02	9.89E-01	3.62E-02	1.58E-01	-1.844	3	Normal
D630004K10Rik	-0.905	-0.401	-1.156	0.214	5.37E-02	2.91E-01	5.36E-03	5.70E-01	-1.156	3	Normal
Dapk1	-0.555	-1.258	-0.569	-0.362	1.23E-01	3.33E-04	5.48E-02	2.05E-01	-1.258	3	Normal
Dbf4	1.255	1.785	1.63	2.096	3.56E-02	1.52E-03	2.72E-03	2.56E-04	2.096	1	Over
Dcdc2a	-0.617	-1.001	-1.066	-0.438	6.16E-02	1.31E-03	5.82E-04	9.82E-02	-1.066	4	Normal
Dck	0.243	0.572	0.69	1.007	4.80E-01	3.27E-02	1.01E-02	4.48E-04	1.007	42wOnly	Over
Ddhd2	1.436	1.74	0.431	0.48	1.74E-02	2.02E-03	3.70E-01	3.24E-01	1.74	1	Normal
Ddx3y	6.613	7.969	7.991	3.915	5.15E-04	2.26E-05	1.94E-05	9.01E-03	7.991	1	Over

Ddx6	-0.511	-0.614	-0.804	-1.155	8.84E-02	1.98E-02	2.96E-03	1.04E-04	-1.155	42wOnly	Under
Ddx60	-0.368	0.811	1.03	0.807	3.47E-01	1.32E-02	2.15E-03	9.13E-03	1.03	2	Normal
Defb1	-1.997	-1.624	-1.714	-0.554	4.07E-02	5.14E-02	3.62E-02	4.81E-01	-1.997	3	Normal
Dennd5b	-0.792	-0.942	-1.054	-0.929	4.54E-03	4.32E-04	1.09E-04	3.40E-04	-1.054	3	Normal
Dgat2	-0.404	-0.315	-1.053	-0.804	1.33E-01	1.56E-01	8.10E-05	9.34E-04	-1.053	3	Normal
Dhodh	-0.163	-1.066	-1.178	-0.684	8.07E-01	6.64E-03	2.90E-03	5.41E-02	-1.178	4	Normal
Dhx58	0.258	1.042	1.061	0.218	6.71E-01	1.35E-02	1.00E-02	5.67E-01	1.061	2	Normal
Dleu2	-1.126	-1.603	-1.636	-1.569	9.25E-03	1.74E-04	1.15E-04	1.75E-04	-1.636	3	Under
Dnaja1	-0.132	-0.937	-0.81	-1.374	8.15E-01	4.57E-03	1.04E-02	1.27E-04	-1.374	42wOnly	Under
Dnajb1	-0.306	-1.173	-1.27	-0.987	4.26E-01	5.30E-04	1.89E-04	1.54E-03	-1.27	4	Normal
Dnajc10	-0.291	0.873	1.009	0.947	4.60E-01	6.81E-03	2.10E-03	2.54E-03	1.009	2	Normal
Dnm2	-0.245	-0.058	-0.541	-1.08	6.17E-01	8.61E-01	1.00E-01	2.26E-03	-1.08	42wOnly	Under
Dnmt1	0.181	0.849	0.787	1.242	6.19E-01	2.21E-03	3.44E-03	5.77E-05	1.242	42wOnly	Over
Dpy19l3	1.431	2.589	3.249	1.113	7.46E-03	9.25E-06	1.25E-06	1.21E-02	3.249	1	Over
Dsg2	-0.592	-1.103	-1.371	-0.783	2.41E-02	4.64E-05	3.88E-06	1.01E-03	-1.371	4	Normal
Dtx3l	-1.307	0.128	0.34	-0.232	6.95E-03	7.42E-01	3.69E-01	5.46E-01	-1.307	2	Normal
Dynll1	-0.228	-1.126	-0.844	-0.252	6.02E-01	1.02E-03	7.64E-03	3.86E-01	-1.126	4	Normal
E2f8	-0.469	-1.096	-0.698	-0.435	4.01E-01	1.60E-02	9.64E-02	2.90E-01	-1.096	3	Normal
Eci3	-3.249	-3.84	-3.84	-2.895	2.27E-04	1.09E-05	1.00E-05	1.98E-04	-3.84	3	Under
Ecm1	-0.439	-0.891	-1.14	-1.363	1.79E-01	2.72E-03	2.62E-04	4.90E-05	-1.363	4	Under
Efna1	0.642	0.377	1.053	0.524	1.56E-01	2.99E-01	7.49E-03	1.44E-01	1.053	1	Normal
Egfr	1.049	0.995	1.453	-0.338	1.51E-01	1.03E-01	1.93E-02	5.62E-01	1.453	1	Normal
Egr2	-2.574	-2.624	-2.422	-2.176	3.69E-03	1.37E-03	2.29E-03	3.82E-03	-2.624	3	Under
Ehd3	-0.45	-0.759	-0.669	-1.441	4.36E-01	9.02E-02	1.21E-01	2.06E-03	-1.441	42wOnly	Under
Eif2s3y	6.367	7.339	7.602	3.741	4.69E-04	2.90E-05	1.87E-05	8.32E-03	7.602	1	Over
Eif3a	-0.299	-0.472	-0.635	-1.032	3.16E-01	5.20E-02	1.02E-02	1.89E-04	-1.032	42wOnly	Under
Eif4e3	-0.74	0.463	-0.092	1.143	6.43E-02	1.64E-01	7.71E-01	1.42E-03	1.143	42wOnly	Over
Eif4g1	-0.412	-0.737	-0.802	-1.187	9.28E-02	1.35E-03	4.96E-04	1.29E-05	-1.187	42wOnly	Under
Elovl3	5.425	4.353	5.931	0.846	2.39E-03	5.68E-03	3.55E-04	5.45E-01	5.931	1	Normal
Enho	-1	-1.81	-1.982	-3.058	1.09E-01	1.78E-03	6.50E-04	1.29E-05	-3.058	4	Under
Enpp1	-1.18	-0.51	-0.831	-0.525	1.86E-03	1.01E-01	9.60E-03	7.76E-02	-1.18	3	Normal
Enpp3	1.347	1.656	1.732	0.448	7.09E-03	5.54E-04	2.86E-04	2.60E-01	1.732	1	Normal
Entpd8	-0.458	-0.565	-0.758	-1.076	1.16E-01	2.56E-02	3.52E-03	1.50E-04	-1.076	42wOnly	Under
Epcam	-0.2	-0.516	-0.909	1.562	8.33E-01	3.07E-01	7.72E-02	3.82E-03	1.562	42wOnly	Over
Eppk1	-0.054	0.684	0.735	1.037	9.38E-01	5.20E-02	3.37E-02	3.61E-03	1.037	42wOnly	Over
Errfi1	0.089	-0.307	-0.254	-1.148	8.94E-01	3.60E-01	4.45E-01	1.91E-03	-1.148	42wOnly	Under

Esm1	0.481	0.686	0.986	2.334	7.22E-01	3.99E-01	2.26E-01	6.92E-03	2.334	42wOnly	Over
Esr1	-1.435	-1.756	-0.84	-0.796	3.86E-02	5.32E-03	1.35E-01	1.51E-01	-1.756	3	Normal
Esrrg	-1.438	-1.123	-1.471	-1.153	1.08E-02	2.28E-02	3.58E-03	1.38E-02	-1.471	3	Under
Evi2a	0.045	1.26	1.056	2.257	9.62E-01	2.29E-02	4.57E-02	2.24E-04	2.257	2	Over
F2r	1.204	1.773	1.522	1.447	5.15E-04	5.49E-06	1.29E-05	3.25E-05	1.773	1	Over
Fabp4	0.304	0.758	0.376	1.744	5.60E-01	4.77E-02	2.90E-01	9.53E-05	1.744	42wOnly	Over
Fam129b	-0.051	0.672	0.688	1.514	9.36E-01	3.37E-02	2.63E-02	5.77E-05	1.514	42wOnly	Over
Fam13a	-0.306	-0.496	-1.192	-0.745	6.50E-01	2.60E-01	1.10E-02	8.71E-02	-1.192	3	Normal
Fam199x	-0.008	-3.692	-3.697	-1.695	9.96E-01	7.60E-06	4.58E-06	6.23E-03	-3.697	4	Under
Fam19a2	-1.653	-3.366	-2.418	-1.531	1.08E-01	6.19E-04	7.16E-03	6.49E-02	-3.366	3	Normal
Fam214a	-0.595	-0.589	-1.311	-1.495	1.46E-01	8.61E-02	5.82E-04	1.61E-04	-1.495	3	Under
Fam26f	-0.559	0.882	0.996	1.423	2.85E-01	4.30E-02	2.15E-02	1.60E-03	1.423	42wOnly	Over
Fam46a	-0.599	-1.435	-1.542	-0.783	1.26E-01	1.95E-04	7.68E-05	1.52E-02	-1.542	4	Normal
Fam49b	-0.026	0.44	0.39	1.186	9.60E-01	1.28E-01	1.65E-01	3.09E-04	1.186	42wOnly	Over
Fam65b	0.07	1.273	1.131	1.542	9.36E-01	5.50E-03	1.00E-02	8.21E-04	1.542	2	Over
Fam84b	-2.256	-1.962	-2.471	-0.198	3.17E-04	4.20E-04	2.89E-05	6.66E-01	-2.471	3	Normal
Fam89a	-0.511	-1.216	-1.106	-1.387	4.15E-01	1.65E-02	2.34E-02	4.76E-03	-1.387	4	Under
Fbxo21	-0.6	0.213	-1.008	-1.401	1.84E-01	5.49E-01	9.37E-03	6.10E-04	-1.401	3	Under
Fcgr1	0.313	0.33	0.237	1.273	5.53E-01	3.60E-01	5.08E-01	1.51E-03	1.273	42wOnly	Over
Fgf1	-0.466	-0.701	-0.775	-1.319	4.29E-01	1.20E-01	8.03E-02	4.41E-03	-1.319	42wOnly	Under
Fgl2	0.153	1.339	1.21	2.029	8.58E-01	5.50E-03	9.18E-03	1.15E-04	2.029	2	Over
Fitm1	2.415	2.904	2.921	1.331	1.08E-02	1.18E-03	8.90E-04	8.17E-02	2.921	1	Normal
Fkbp7	-0.1	0.449	0.315	1.046	8.33E-01	8.76E-02	2.07E-01	3.53E-04	1.046	42wOnly	Over
Flna	0.306	0.479	0.557	1.42	5.47E-01	1.82E-01	1.14E-01	4.34E-04	1.42	42wOnly	Over
Fmo1	-0.945	-1.07	-1.43	-0.726	6.72E-03	1.03E-03	4.41E-05	1.14E-02	-1.43	3	Normal
Fmo2	-2.6	-3.363	-4.133	-0.687	4.93E-04	9.34E-06	1.40E-06	2.17E-01	-4.133	3	Normal
Fmo3	-8.257	-9.815	-9.826	-5.011	2.02E-04	9.14E-06	7.43E-06	3.84E-03	-9.826	3	Under
Fmo4	-1.304	-0.729	-1.641	0.143	3.28E-02	1.50E-01	2.95E-03	7.72E-01	-1.641	3	Normal
Fosl2	0.501	-0.127	0.828	1.306	2.75E-01	7.29E-01	2.88E-02	1.19E-03	1.306	42wOnly	Over
Frk	-0.816	-0.503	-1.095	0.151	1.38E-01	2.60E-01	1.94E-02	7.31E-01	-1.095	3	Normal
Frmd4b	-0.542	-1.165	-0.656	-1.25	3.90E-01	2.28E-02	1.66E-01	1.07E-02	-1.25	3	Under
Fst	1.499	1.339	3.154	3.014	1.16E-01	9.46E-02	4.50E-04	5.64E-04	3.154	1	Over
Fut8	-1.695	-1.347	-1.476	-0.6	5.29E-05	7.10E-05	2.19E-05	2.73E-02	-1.695	3	Normal
G6pdx	0.091	0.991	0.407	1.701	9.32E-01	4.94E-02	3.85E-01	1.32E-03	1.701	42wOnly	Over
Gabrb3	0.092	0.13	0.452	1.101	7.80E-01	4.70E-01	1.92E-02	1.29E-05	1.101	42wOnly	Over
Gadd45b	-1.253	-1.851	-2.429	-1.886	2.37E-02	5.47E-04	2.68E-05	3.20E-04	-2.429	4	Under

Garem	0.57	0.589	1.175	0.629	3.53E-02	1.43E-02	2.88E-05	6.31E-03	1.175	1	Normal
Gas2l3	0.454	1.07	0.177	1.744	4.23E-01	1.84E-02	6.66E-01	3.29E-04	1.744	1	Over
Gbp8	-0.873	-0.03	-0.015	1.454	1.15E-01	9.49E-01	9.71E-01	2.54E-03	1.454	42wOnly	Over
Gcc2	-0.518	-0.758	-0.598	-1.332	1.70E-01	2.07E-02	5.36E-02	2.21E-04	-1.332	42wOnly	Under
Gda	0.128	0.158	0.59	1.083	7.40E-01	4.80E-01	1.46E-02	1.02E-04	1.083	42wOnly	Over
Ggct	-0.805	-0.95	-1.094	-0.961	1.53E-02	2.07E-03	4.89E-04	1.30E-03	-1.094	3	Normal
Gigyf2	-0.143	-1.427	-0.921	-1.486	8.27E-01	6.05E-04	1.35E-02	2.94E-04	-1.486	4	Under
Glipr1	0.244	0.642	0.42	2.192	6.08E-01	5.47E-02	1.84E-01	3.06E-06	2.192	42wOnly	Over
Gm17753	-0.597	-0.861	-1.035	-1.166	1.63E-02	4.03E-04	4.49E-05	1.87E-05	-1.166	3	Under
Gm2788	-1.286	-2.155	-1.721	-2.738	1.41E-01	5.91E-03	2.01E-02	5.90E-04	-2.738	3	Under
Gmds	-0.44	-1.816	-1.628	-0.721	4.32E-01	3.18E-04	6.81E-04	8.17E-02	-1.816	4	Normal
Gnai1	1.532	2.377	2.388	2.192	1.06E-03	6.95E-06	3.19E-06	1.29E-05	2.388	2	Over
Gnpda2	-0.199	1.215	0.852	1.396	6.15E-01	1.65E-04	3.43E-03	4.51E-05	1.396	2	Over
Gpc1	0.47	1.825	1.471	1.552	4.29E-01	5.03E-04	2.76E-03	1.37E-03	1.825	2	Over
Gprin3	-0.019	-0.694	-1.122	-1.557	9.72E-01	2.61E-02	7.48E-04	4.16E-05	-1.557	4	Under
Grina	0.518	0.417	0.651	1.017	6.96E-02	8.61E-02	9.37E-03	2.34E-04	1.017	42wOnly	Over
Gstm3	0.422	1.211	1.147	2.074	4.32E-01	6.21E-03	7.73E-03	4.90E-05	2.074	2	Over
Gstp1	1.173	1.166	1.236	0.792	1.66E-04	4.63E-05	2.14E-05	1.40E-03	1.236	1	Normal
Gstt3	-1.081	-0.595	-1.012	-0.721	6.86E-02	2.24E-01	4.29E-02	1.32E-01	-1.081	3	Normal
Gusb	0.183	0.136	0.036	1.051	7.46E-01	6.86E-01	9.10E-01	3.11E-03	1.051	42wOnly	Over
H2-Eb1	-0.001	0.537	0.469	1.528	9.98E-01	1.82E-01	2.29E-01	6.44E-04	1.528	42wOnly	Over
Hamp2	-2.182	-2.826	-3.425	-3.505	6.42E-02	7.73E-03	1.59E-03	1.05E-03	-3.505	3	Under
Hao2	-4.683	-5.578	-5.829	-4.717	1.04E-03	6.87E-05	3.49E-05	2.91E-04	-5.829	3	Under
Hck	-0.063	1.089	0.867	1.84	9.57E-01	4.05E-02	8.73E-02	1.01E-03	1.84	2	Over
Hdlbp	-0.661	-0.557	-0.736	-1.527	4.29E-02	4.69E-02	9.71E-03	1.87E-05	-1.527	42wOnly	Under
Hes1	0.325	0.814	0.126	1.184	4.70E-01	2.23E-02	6.95E-01	1.22E-03	1.184	42wOnly	Over
Hexb	-1.821	-0.771	-1.249	0.282	4.81E-04	6.16E-02	3.90E-03	4.71E-01	-1.821	3	Normal
Hgd	-0.464	-0.754	-0.605	-1.104	2.75E-01	3.48E-02	7.57E-02	2.35E-03	-1.104	42wOnly	Under
Hist2h2be	-0.859	-1.663	-0.95	-0.459	2.22E-02	2.68E-05	4.53E-03	1.27E-01	-1.663	3	Normal
Hmgb2	0.053	0.962	0.86	1.49	9.45E-01	1.33E-02	2.12E-02	3.15E-04	1.49	42wOnly	Over
Hmgcs1	-1.702	-1.747	-1.081	-1.309	2.15E-02	8.52E-03	7.66E-02	3.09E-02	-1.747	3	Under
Hmgcs2	-0.123	-0.91	-0.839	-1.848	8.66E-01	2.48E-02	3.16E-02	8.17E-05	-1.848	42wOnly	Under
Homer2	-0.748	-0.967	-1.388	-0.409	1.04E-01	1.68E-02	1.05E-03	2.63E-01	-1.388	3	Normal
Hook2	0.545	1.039	0.498	0.93	1.31E-01	1.88E-03	9.13E-02	2.98E-03	1.039	1	Normal
Hpgd	-0.546	-0.883	-1.511	-1.121	2.52E-01	2.85E-02	5.18E-04	4.73E-03	-1.511	3	Under
Hsd17b2	-0.752	-0.586	-0.505	-1.022	6.95E-03	1.66E-02	3.05E-02	1.56E-04	-1.022	42wOnly	Under

Hsd17b6	-1.374	-0.895	-1.317	-1.372	2.28E-02	7.99E-02	1.19E-02	7.48E-03	-1.374	3	Under
Hsd17b7	-0.707	-0.681	-0.943	-1.662	8.54E-02	5.22E-02	8.71E-03	7.17E-05	-1.662	42wOnly	Under
Hsd3b2	1.469	1.699	1.594	0.708	3.39E-03	4.01E-04	5.66E-04	7.54E-02	1.699	1	Normal
Hsd3b5	6.269	5.963	6.7	1.094	1.59E-03	1.05E-03	2.86E-04	4.81E-01	6.7	1	Normal
Hsdl2	-0.347	-1.1	-0.923	-1.033	2.12E-01	7.20E-05	3.71E-04	1.17E-04	-1.1	4	Under
Hsf2bp	0.525	1.32	1.91	1.938	4.55E-01	1.91E-02	1.20E-03	8.71E-04	1.938	2	Over
Hsp90aa1	0.087	-1.679	-0.867	-1.076	9.01E-01	1.08E-04	1.91E-02	3.82E-03	-1.679	4	Under
Hspa1b	0.454	-2.633	-2.825	-2.192	6.49E-01	6.05E-04	2.51E-04	1.87E-03	-2.825	4	Under
Hspa4l	-0.194	-1.678	-1.431	-1.09	6.50E-01	9.14E-06	4.39E-05	5.64E-04	-1.678	4	Under
Hsph1	-0.036	-2.779	-1.732	-1.781	9.67E-01	7.65E-06	8.32E-04	5.42E-04	-2.779	4	Under
Htra4	-0.929	-1.037	-1.037	-1.037	2.55E-03	3.95E-04	3.12E-04	2.85E-04	-1.037	3	Under
Hykk	-0.707	-0.754	-1.737	-2.21	1.61E-02	4.86E-03	1.40E-06	4.81E-08	-2.21	3	Under
Icam1	0.425	0.806	1.019	1.581	3.59E-01	3.19E-02	7.30E-03	1.73E-04	1.581	1	Over
Ier5	0.551	0.755	1.207	1.899	1.77E-01	3.10E-02	1.14E-03	1.76E-05	1.899	1	Over
Ifi27	0.274	1.086	1.356	1.268	3.31E-01	7.03E-05	4.58E-06	1.68E-05	1.356	2	Over
Ifi27l2b	-1.022	0.534	0.937	2.188	4.70E-02	2.08E-01	3.10E-02	4.83E-05	2.188	2	Over
Ifi30	0.153	0.71	0.439	1.526	8.15E-01	5.00E-02	1.96E-01	2.03E-04	1.526	42wOnly	Over
Ifi44	-0.134	0.908	1.288	1.538	8.65E-01	3.37E-02	3.58E-03	6.61E-04	1.538	2	Over
Ifi47	-0.282	1.022	1.886	0.986	6.16E-01	1.27E-02	5.04E-05	1.07E-02	1.886	2	Normal
Ifit1	-0.573	0.566	1.444	1.11	2.89E-01	1.89E-01	2.40E-03	1.11E-02	1.444	2	Over
Ifit2	-0.724	0.12	0.206	1.431	1.73E-01	7.81E-01	6.21E-01	1.97E-03	1.431	42wOnly	Over
Ifitm6	0.285	1.261	0.828	2.71	8.51E-01	1.15E-01	2.77E-01	1.49E-03	2.71	42wOnly	Over
Ift74	0.236	0.84	0.745	1.177	5.51E-01	5.91E-03	1.10E-02	2.66E-04	1.177	42wOnly	Over
Igf2r	0.385	0.456	0.386	1.017	3.27E-01	1.41E-01	1.96E-01	1.97E-03	1.017	42wOnly	Over
Igfals	-1.268	-0.933	-1.31	-1.097	1.66E-04	1.05E-03	2.81E-05	1.75E-04	-1.31	3	Under
Igfbp2	-0.561	-0.598	-1.031	-1.863	2.35E-01	1.20E-01	9.87E-03	6.84E-05	-1.863	3	Under
Ighg	0.033	1.051	1.181	3.753	9.91E-01	3.02E-01	2.39E-01	9.96E-04	3.753	42wOnly	Over
Ighm	0.425	1.136	1.61	2.711	7.65E-01	1.70E-01	5.27E-02	2.09E-03	2.711	42wOnly	Over
Igk	0.132	0.595	0.481	1.592	8.94E-01	2.42E-01	3.29E-01	3.21E-03	1.592	42wOnly	Over
Ikbip	-1.086	-0.843	-0.709	0.117	1.08E-02	2.29E-02	4.52E-02	7.30E-01	-1.086	3	Normal
Il1r1	1.081	0.78	1.796	1.205	4.99E-02	9.40E-02	5.43E-04	9.39E-03	1.796	1	Over
Il33	-0.261	0.036	0.146	1.391	5.25E-01	9.04E-01	6.07E-01	9.87E-05	1.391	42wOnly	Over
Il6st	0.21	0.837	1.302	0.561	6.04E-01	5.68E-03	8.89E-05	3.95E-02	1.302	2	Normal
Ildr2	-1.591	-0.664	-0.635	0.307	1.46E-03	1.02E-01	1.06E-01	4.29E-01	-1.591	3	Normal
Inhbb	1.303	0.49	1.027	1.892	9.46E-02	4.30E-01	1.05E-01	4.56E-03	1.892	42wOnly	Over
Insc	0.782	0.599	1.557	0.369	1.84E-01	2.10E-01	2.99E-03	4.30E-01	1.557	1	Normal

Iqgap1	-0.065	0.505	0.467	1.652	9.23E-01	1.15E-01	1.32E-01	4.51E-05	1.652	42wOnly	Over
Irf2bp2	0.221	-1.131	-0.123	-0.621	6.16E-01	1.00E-03	6.69E-01	3.53E-02	-1.131	4	Normal
Irf7	0.251	1.553	1.544	1.729	5.07E-01	1.55E-05	1.41E-05	7.62E-06	1.729	2	Over
Irs2	-0.254	-1.595	-0.756	-1.381	7.50E-01	2.65E-03	1.07E-01	5.08E-03	-1.595	4	Under
Isyna1	0.134	0.588	0.843	1.817	9.15E-01	3.18E-01	1.54E-01	3.92E-03	1.817	42wOnly	Over
Jak1	0.026	0.009	-0.643	-1.121	9.73E-01	9.84E-01	1.07E-01	7.01E-03	-1.121	42wOnly	Under
Jchain	-0.069	0.817	1.717	2.484	9.60E-01	2.23E-01	1.48E-02	8.59E-04	2.484	2	Over
Kalrn	-0.32	-0.927	-0.649	-1.001	3.81E-01	2.83E-03	2.43E-02	1.07E-03	-1.001	42wOnly	Under
Kcnt2	-0.037	0.592	2.002	1.753	9.74E-01	3.27E-01	3.08E-03	6.16E-03	2.002	2	Over
Kdm5a	-0.524	-0.235	-0.609	-1.057	4.85E-02	2.77E-01	8.83E-03	8.41E-05	-1.057	42wOnly	Under
Kdm5d	3.671	4.831	4.534	2.272	1.01E-03	2.04E-05	3.57E-05	1.10E-02	4.831	1	Over
Kdm6a	-0.725	-1.138	-0.916	-0.762	6.95E-03	3.50E-05	3.15E-04	1.35E-03	-1.138	3	Normal
Kif1b	0.007	-1.024	-0.93	-0.398	9.96E-01	3.88E-03	6.70E-03	2.02E-01	-1.024	4	Normal
Klf10	0.449	-0.509	-1.367	-1.273	4.23E-01	2.23E-01	2.99E-03	3.82E-03	-1.367	4	Under
Klf15	-0.21	-0.533	-0.81	-1.305	6.62E-01	9.50E-02	1.33E-02	2.91E-04	-1.305	42wOnly	Under
Klhl13	-1.052	-1.338	-1.312	-0.17	1.03E-02	6.34E-04	6.00E-04	6.05E-01	-1.338	3	Normal
Klhl25	-0.682	-1.07	-1.013	-0.456	4.07E-02	7.69E-04	1.04E-03	8.87E-02	-1.07	3	Normal
Lama3	1.82	1.278	1.332	0.509	1.51E-03	9.81E-03	6.48E-03	2.52E-01	1.82	1	Normal
Lars2	0.2	-1.438	-1.428	-0.618	6.71E-01	1.09E-04	9.64E-05	4.01E-02	-1.438	4	Normal
Lcn2	-0.361	2.355	5.193	5.846	8.66E-01	4.34E-02	1.09E-04	4.51E-05	5.846	2	Over
Ldhd	0.522	0.794	1.029	0.328	7.97E-02	3.55E-03	3.15E-04	1.68E-01	1.029	1	Normal
Lepr	-2.328	-3.164	-3.593	-1.239	1.58E-02	6.45E-04	1.49E-04	1.10E-01	-3.593	3	Normal
Lgals1	0.706	0.815	0.9	1.899	1.13E-01	3.37E-02	1.80E-02	4.56E-05	1.899	42wOnly	Over
Lgals3	0.217	1.046	0.869	2.488	8.15E-01	4.22E-02	7.78E-02	5.77E-05	2.488	2	Over
Lgals4	0.145	-0.851	-1.119	-1.073	8.65E-01	6.09E-02	1.47E-02	1.51E-02	-1.119	4	Under
Lhpp	-0.785	-0.775	-1.34	-1.249	3.00E-01	1.96E-01	2.95E-02	3.56E-02	-1.34	3	Under
Lifr	-0.199	-0.83	-0.831	-1.502	8.15E-01	7.81E-02	6.99E-02	2.12E-03	-1.502	42wOnly	Under
Lipc	-0.67	-0.676	-0.796	-1.389	1.42E-01	7.81E-02	3.59E-02	7.66E-04	-1.389	42wOnly	Under
Lipg	-1.057	-1.116	-2.361	-2.178	3.20E-01	1.82E-01	7.73E-03	1.02E-02	-2.361	3	Under
Litaf	0.418	0.508	1.329	1.119	2.29E-01	7.68E-02	8.10E-05	3.94E-04	1.329	1	Over
LOC74457	-0.95	-1.692	-2.178	-2.041	2.46E-01	1.61E-02	2.55E-03	3.13E-03	-2.178	4	Under
Lonrf1	0.359	0.88	0.306	1.299	4.14E-01	1.35E-02	3.34E-01	4.71E-04	1.299	42wOnly	Over
Loxl4	-0.824	-1.21	-0.339	-0.533	1.13E-01	8.84E-03	4.08E-01	1.98E-01	-1.21	3	Normal
Lpin1	0.412	-1.13	-1.783	-1.951	7.47E-01	1.42E-01	2.36E-02	1.15E-02	-1.951	4	Under
Lpl	0.66	1.471	1.629	2.588	3.75E-01	1.64E-02	7.35E-03	1.38E-04	2.588	2	Over
Lrg1	0.578	0.745	1.726	1.026	1.74E-01	3.92E-02	4.67E-05	4.39E-03	1.726	1	Over

Lrp6	0.093	-0.424	-0.535	-1.004	8.28E-01	7.66E-02	2.56E-02	2.24E-04	-1.004	42wOnly	Under
Lrrc16a	1.278	1.853	1.582	1.39	4.22E-02	1.68E-03	4.71E-03	8.86E-03	1.853	1	Over
Lum	-0.334	-0.069	-0.805	1.218	4.36E-01	8.30E-01	1.73E-02	7.17E-04	1.218	42wOnly	Over
Lurap1l	0.603	-1.008	-0.517	-1.112	6.84E-02	1.32E-03	6.05E-02	3.69E-04	-1.112	4	Under
Ly6d	0.444	1.107	1.715	4.364	8.19E-01	2.84E-01	9.90E-02	3.01E-04	4.364	42wOnly	Over
Ly6e	-0.535	0.316	0.669	1.273	1.79E-01	3.19E-01	4.23E-02	4.88E-04	1.273	42wOnly	Over
Maf	-0.334	1.025	1.061	0.671	3.74E-01	1.68E-03	1.03E-03	1.98E-02	1.061	2	Normal
Mafb	-0.652	-1.067	-1.969	-2.54	4.32E-01	9.50E-02	3.72E-03	3.59E-04	-2.54	3	Under
Magt1	-0.204	-0.906	-0.572	-1.327	6.23E-01	3.55E-03	4.45E-02	9.57E-05	-1.327	42wOnly	Under
Mamdc2	-0.487	-0.873	-1.158	-0.902	2.68E-01	1.99E-02	2.76E-03	1.13E-02	-1.158	4	Normal
Map7d1	0.07	0.268	0.904	1.084	8.74E-01	2.43E-01	6.13E-04	1.05E-04	1.084	42wOnly	Over
Mcm10	0.787	1.209	0.586	-0.326	5.57E-02	1.68E-03	8.31E-02	3.23E-01	1.209	1	Normal
Mcm4	0.271	0.289	1.055	1.209	5.51E-01	3.53E-01	2.68E-03	6.59E-04	1.209	1	Over
Mcm5	0.216	0.545	0.989	2.019	8.15E-01	2.71E-01	5.11E-02	3.93E-04	2.019	42wOnly	Over
Mcm6	0.217	0.646	0.857	1.981	8.33E-01	2.42E-01	1.18E-01	1.15E-03	1.981	42wOnly	Over
Mctp2	0.323	0.752	1.114	0.459	2.44E-01	2.40E-03	4.49E-05	3.62E-02	1.114	2	Normal
Meg3	0.622	2.516	3.268	1.474	5.82E-01	3.75E-03	3.30E-04	5.66E-02	3.268	2	Normal
Meiob	-0.424	0.956	1.225	0.156	2.47E-01	3.27E-03	3.15E-04	5.84E-01	1.225	2	Normal
Mettl20	1.644	0.119	0.684	0.215	1.66E-04	7.10E-01	3.63E-02	4.93E-01	1.644	1	Normal
Mfsd2a	-1.394	-1.262	-2.211	-2.654	2.68E-01	2.09E-01	3.15E-02	9.65E-03	-2.654	3	Under
Mgat5	0.412	0.757	1.511	0.994	2.59E-01	1.60E-02	3.49E-05	1.60E-03	1.511	1	Normal
Mgll	-0.422	-0.585	-0.862	-1.16	3.90E-01	1.24E-01	2.57E-02	3.27E-03	-1.16	42wOnly	Under
Mia3	-0.575	-0.899	-0.926	-1.379	2.99E-02	4.62E-04	2.83E-04	7.62E-06	-1.379	42wOnly	Under
Mlkl	-0.441	0.492	0.879	1.622	2.75E-01	1.32E-01	9.91E-03	5.77E-05	1.622	42wOnly	Over
Mmd	-0.753	-0.702	-1.04	-1.19	4.39E-02	3.11E-02	2.30E-03	5.58E-04	-1.19	3	Under
Mme	-0.861	-1.207	-0.897	-0.772	1.19E-01	1.35E-02	4.95E-02	8.17E-02	-1.207	3	Normal
Mpeg1	0.215	1.228	1.529	1.864	7.07E-01	2.36E-03	2.81E-04	4.83E-05	1.864	2	Over
Mpp4	1.699	-0.166	0.589	-0.109	2.86E-03	7.16E-01	1.88E-01	8.08E-01	1.699	1	Normal
Mpzl2	-0.362	-0.311	-1.053	-1.109	4.39E-01	3.66E-01	5.57E-03	3.03E-03	-1.109	3	Under
Mr1	-0.204	1.121	0.754	0.975	8.07E-01	1.78E-02	8.69E-02	2.67E-02	1.121	2	Normal
Ms4a4b	-0.534	1.254	0.795	1.693	2.75E-01	3.78E-03	4.52E-02	2.24E-04	1.693	2	Over
Ms4a4c	0.058	0.734	0.496	1.37	9.52E-01	9.25E-02	2.31E-01	2.51E-03	1.37	42wOnly	Over
Msln	0.273	0.078	-0.032	1.095	3.59E-01	7.31E-01	8.83E-01	9.25E-05	1.095	42wOnly	Over
Msmo1	-1.649	-1.675	-1.568	-1.907	7.46E-03	2.86E-03	4.08E-03	6.69E-04	-1.907	3	Under
Msr1	-0.083	0.96	0.51	1.599	9.22E-01	2.24E-02	1.87E-01	3.72E-04	1.599	42wOnly	Over
Mtnr1a	0.243	1.438	1.476	0.644	7.50E-01	4.13E-03	2.99E-03	1.44E-01	1.476	2	Normal

Mup10	1.623	2.329	1.571	-1.883	2.23E-01	3.75E-02	1.35E-01	7.31E-02	2.329	1	Normal
Mvp	-0.138	0.507	0.572	1.133	8.15E-01	1.17E-01	7.23E-02	1.14E-03	1.133	42wOnly	Over
Mycl	-0.404	-1.305	-1.524	-1.119	3.37E-01	6.34E-04	1.06E-04	1.56E-03	-1.524	4	Under
Myh10	0.618	0.778	0.76	1.149	1.27E-01	2.66E-02	2.61E-02	1.40E-03	1.149	42wOnly	Over
Myh9	0.039	0.236	0.729	1.09	9.36E-01	2.91E-01	3.22E-03	8.48E-05	1.09	42wOnly	Over
N4bp2l1	-0.375	-0.714	-1.326	-0.735	4.27E-01	5.20E-02	8.96E-04	3.63E-02	-1.326	3	Normal
Nat8	4.486	5.914	6.227	3.92	7.04E-04	1.21E-05	5.52E-06	6.12E-04	6.227	1	Over
Nceh1	-0.749	-1.323	-1.545	-1.232	3.20E-02	1.46E-04	2.27E-05	2.36E-04	-1.545	4	Under
Nckap1l	-0.227	0.485	0.376	1.361	7.06E-01	1.99E-01	3.02E-01	1.04E-03	1.361	42wOnly	Over
Ndufab1	0.256	-1.208	-0.556	-0.722	5.86E-01	1.23E-03	8.69E-02	2.60E-02	-1.208	4	Normal
Necap2	0.076	0.559	0.437	1.034	8.74E-01	3.41E-02	8.14E-02	3.29E-04	1.034	42wOnly	Over
Nek6	-0.034	0.62	1	0.865	9.60E-01	7.20E-02	5.28E-03	1.08E-02	1	2	Normal
Nfkbie	0.03	0.801	0.613	1.48	9.60E-01	1.58E-02	4.91E-02	8.59E-05	1.48	42wOnly	Over
Nid1	-0.334	-0.144	0.123	1.588	5.81E-01	7.31E-01	7.60E-01	6.61E-04	1.588	42wOnly	Over
Nipal1	-3.038	-4.364	-5.01	-2.005	9.25E-03	1.59E-04	2.89E-05	3.42E-02	-5.01	3	Under
Nmnat1	0.157	1.499	1.539	0.746	7.71E-01	8.28E-05	4.99E-05	1.64E-02	1.539	2	Normal
Nod1	0.099	0.694	0.553	1.157	8.26E-01	8.60E-03	2.70E-02	9.19E-05	1.157	42wOnly	Over
Notum	-0.652	-0.401	-1.148	-1.258	1.77E-01	2.99E-01	6.31E-03	2.54E-03	-1.258	3	Under
Nox4	0.934	1.416	1.137	0.289	6.26E-02	2.30E-03	9.37E-03	4.76E-01	1.416	1	Normal
Nr1i3	-0.639	-0.345	-1.014	-0.806	1.46E-01	3.25E-01	7.75E-03	2.40E-02	-1.014	3	Normal
Nrep	-1.117	-1.298	-1.625	-0.405	1.46E-01	4.68E-02	1.34E-02	5.09E-01	-1.625	3	Normal
Nt5e	-2.768	-3.651	-3.649	-2.389	3.63E-04	7.60E-06	4.29E-06	3.56E-04	-3.651	3	Under
Ntmt1	-1.231	-1.253	-1.355	-1.01	2.77E-03	1.01E-03	3.78E-04	3.59E-03	-1.355	3	Under
Nudt7	1.191	2.117	2.1	0.282	8.01E-02	1.05E-03	8.96E-04	6.07E-01	2.117	2	Normal
Nxpe2	-0.433	-0.48	-0.984	-1.951	4.80E-01	2.84E-01	3.37E-02	2.34E-04	-1.951	42wOnly	Under
Oasl1	-0.172	0.947	1.171	0.892	7.14E-01	3.58E-03	4.93E-04	3.77E-03	1.171	2	Normal
Oasl2	0.112	0.507	0.771	1.785	8.79E-01	1.84E-01	4.57E-02	1.04E-04	1.785	42wOnly	Over
Obp2a	1.088	2.621	3.023	1.252	2.36E-01	1.68E-03	3.76E-04	8.18E-02	3.023	2	Normal
Ociad2	1.354	1.83	1.687	0.861	9.88E-04	1.55E-05	3.08E-05	9.13E-03	1.83	1	Normal
Ocln	-0.334	-1.134	-1.008	-1.134	2.23E-01	4.02E-05	1.24E-04	4.83E-05	-1.134	4	Under
Odf3b	-0.739	-0.434	-0.722	-1.164	6.52E-02	1.90E-01	3.29E-02	1.28E-03	-1.164	42wOnly	Under
Olfm3	0.371	1.778	1.605	1.211	4.81E-01	1.65E-04	3.76E-04	3.25E-03	1.778	2	Over
Olig1	1.876	1.866	2.145	0.925	5.68E-03	2.49E-03	6.20E-04	8.61E-02	2.145	1	Normal
Omd	0.738	1.548	0.902	0.528	2.05E-01	2.97E-03	5.61E-02	2.47E-01	1.548	1	Normal
Onecut1	-1.091	-0.724	-0.62	-1.324	1.62E-01	2.51E-01	3.11E-01	3.55E-02	-1.324	42wOnly	Under
Orm2	-1.555	1.034	3.435	3.774	7.65E-02	1.57E-01	8.85E-05	4.56E-05	3.774	2	Over

Orm3	-2.013	0.425	1.816	2.841	3.17E-03	4.26E-01	2.74E-03	4.83E-05	2.841	2	Over
Os9	-0.214	-0.229	-0.457	-1.035	4.39E-01	2.67E-01	3.24E-02	6.49E-05	-1.035	42wOnly	Under
Osbpl3	0.729	1.201	1.084	2.312	2.23E-01	1.92E-02	2.81E-02	8.41E-05	2.312	2	Over
Osgin1	1.092	0.702	1.257	1.141	9.48E-02	1.91E-01	2.35E-02	3.22E-02	1.257	1	Over
Osmr	0.461	-0.022	0.215	1.682	2.75E-01	9.49E-01	5.09E-01	5.95E-05	1.682	42wOnly	Over
Otc	-0.628	-0.562	-0.787	-1.063	1.14E-01	9.21E-02	1.99E-02	2.21E-03	-1.063	42wOnly	Under
P4ha1	0.182	-1.249	-1.182	-0.619	7.87E-01	2.80E-03	3.72E-03	9.07E-02	-1.249	4	Normal
P4ha2	0.196	-2.088	-1.617	-0.473	8.07E-01	7.41E-05	7.87E-04	2.54E-01	-2.088	4	Normal
Palld	-0.117	-1.081	-0.356	-0.167	8.02E-01	3.04E-04	1.49E-01	4.96E-01	-1.081	4	Normal
Pank1	-0.268	-0.48	-0.816	-1.21	5.57E-01	1.38E-01	1.46E-02	6.61E-04	-1.21	42wOnly	Under
Papss2	-0.819	-0.91	-1.149	-0.749	8.33E-02	2.73E-02	6.02E-03	5.17E-02	-1.149	3	Normal
Pcdh17	-0.3	0.621	0.248	1.755	6.69E-01	1.73E-01	5.69E-01	5.48E-04	1.755	42wOnly	Over
Pcf11	-0.221	-0.705	-0.818	-1.476	5.51E-01	1.27E-02	3.95E-03	1.96E-05	-1.476	42wOnly	Under
Pck1	-0.093	-0.724	-0.855	-2.044	9.50E-01	2.63E-01	1.84E-01	3.17E-03	-2.044	42wOnly	Under
Pcp4l1	-1.374	-3.591	-3.576	-2.921	1.08E-01	4.30E-05	3.90E-05	2.95E-04	-3.591	4	Under
Pde4d	-1.204	-0.688	-0.521	0.039	4.82E-03	5.53E-02	1.28E-01	9.04E-01	-1.204	3	Normal
Pde8a	-0.421	-0.306	-0.663	-1.308	1.78E-01	2.27E-01	1.31E-02	4.90E-05	-1.308	42wOnly	Under
Pdgfc	-0.038	-0.371	1.043	0.896	9.60E-01	2.54E-01	3.53E-03	7.90E-03	1.043	1	Normal
Pdzk1ip1	0.068	0.493	-0.368	1.293	9.55E-01	3.29E-01	4.61E-01	1.35E-02	1.293	42wOnly	Over
Peg3	-0.489	-1.119	-0.828	-0.567	2.07E-01	1.67E-03	1.18E-02	6.59E-02	-1.119	3	Normal
Pgd	0.516	0.685	0.724	1.28	1.97E-01	4.22E-02	2.90E-02	4.47E-04	1.28	42wOnly	Over
Pi4kb	0.084	1.685	1.706	0.741	8.67E-01	7.60E-06	3.88E-06	7.35E-03	1.706	2	Normal
Pim1	1.666	1.793	1.698	1.567	9.88E-04	1.80E-04	2.69E-04	4.69E-04	1.793	1	Over
Pim3	-0.112	-1.29	-1.397	-2.506	9.34E-01	4.62E-02	2.88E-02	3.84E-04	-2.506	4	Under
Pisd-ps3	1.201	0.304	0.17	1.053	6.95E-03	3.86E-01	6.27E-01	5.09E-03	1.201	1	Over
Pitpnm1	0.245	0.786	0.662	1.467	4.29E-01	2.51E-03	7.59E-03	7.62E-06	1.467	42wOnly	Over
Pkhd1	-0.913	-1.336	-0.491	-0.169	4.16E-02	1.53E-03	1.76E-01	6.39E-01	-1.336	3	Normal
Pla2g15	-0.383	1.348	0.338	0.812	4.32E-01	1.33E-03	3.39E-01	2.64E-02	1.348	2	Normal
Pla2g16	-0.966	-1.108	-1.103	-0.273	6.69E-02	1.77E-02	1.54E-02	5.22E-01	-1.108	3	Normal
Pla2g6	0.827	1.076	0.559	-0.073	1.25E-01	2.23E-02	1.94E-01	8.67E-01	1.076	1	Normal
Plac8	-0.101	0.936	0.814	2.097	8.94E-01	2.25E-02	3.79E-02	3.07E-05	2.097	42wOnly	Over
Plek	-0.296	0.832	0.924	1.906	6.90E-01	8.58E-02	5.19E-02	3.76E-04	1.906	42wOnly	Over
Plekha1	0.784	0.648	0.795	1.449	6.84E-02	7.76E-02	2.96E-02	3.60E-04	1.449	42wOnly	Over
Plgrkt	-0.591	0.532	0.198	1.017	5.37E-02	4.32E-02	4.14E-01	3.88E-04	1.017	42wOnly	Over
Plin5	0.107	-1.187	-0.926	-1.273	9.07E-01	1.48E-02	4.36E-02	6.35E-03	-1.273	4	Under
Plk2	0.218	0.772	0.636	1.292	6.97E-01	3.63E-02	7.15E-02	8.93E-04	1.292	42wOnly	Over

Plk4	0.017	0.363	0.158	1.137	9.74E-01	1.99E-01	5.63E-01	3.94E-04	1.137	42wOnly	Over
Plscr1	-0.034	0.141	0.576	1.022	9.52E-01	5.67E-01	2.65E-02	3.71E-04	1.022	42wOnly	Over
Pmp22	-0.123	0.339	-0.198	1.146	8.47E-01	3.02E-01	5.41E-01	1.54E-03	1.146	42wOnly	Over
Por	-0.66	-0.7	-1.403	-0.368	2.37E-01	1.23E-01	3.89E-03	4.00E-01	-1.403	3	Normal
Ppapdc1b	-1.366	-1.64	-1.167	-0.918	1.33E-03	8.06E-05	1.84E-03	7.99E-03	-1.64	3	Normal
Pparg	0.43	0.643	0.628	1.222	2.21E-01	3.10E-02	2.98E-02	2.21E-04	1.222	42wOnly	Over
Ppargc1b	-0.135	0.06	-1.275	-1.29	8.73E-01	8.92E-01	6.59E-03	4.76E-03	-1.29	3	Under
Ppp1r14a	0.28	1.477	1.72	1.617	6.29E-01	1.03E-03	1.89E-04	3.15E-04	1.72	2	Over
Ppp1r9a	0.609	1.831	1.756	0.812	1.46E-01	2.73E-05	3.83E-05	1.81E-02	1.831	2	Normal
Prg4	-0.378	0.386	1.662	1.084	4.36E-01	2.85E-01	1.42E-04	4.57E-03	1.662	2	Over
Prkd3	-0.519	0.036	-0.822	-1.786	2.15E-01	9.16E-01	1.91E-02	4.08E-05	-1.786	42wOnly	Under
Prlr	-2.498	-2.284	-2.739	-1.953	2.81E-03	2.40E-03	3.95E-04	5.09E-03	-2.739	3	Under
Prnp	0.126	0.594	0.521	1.226	8.07E-01	3.99E-02	6.09E-02	1.75E-04	1.226	42wOnly	Over
Proca1	1.398	0.72	1.486	0.603	1.00E-02	1.13E-01	2.49E-03	1.62E-01	1.486	1	Normal
Prom1	-2.938	-3.36	-3.224	0.404	4.81E-04	3.46E-05	4.60E-05	5.20E-01	-3.36	3	Normal
Pros1	0.037	0.5	0.505	1.251	9.36E-01	3.62E-02	3.05E-02	2.72E-05	1.251	42wOnly	Over
Prrc2c	-0.179	-0.526	-0.621	-1.048	6.45E-01	4.88E-02	1.99E-02	3.53E-04	-1.048	42wOnly	Under
Prss8	0.526	1.555	0.619	1.111	1.91E-01	9.79E-05	5.92E-02	1.60E-03	1.555	1	Over
Prtn3	0.064	1.409	4.126	3.88	9.74E-01	2.16E-01	1.24E-03	1.61E-03	4.126	2	Over
Psmb8	-0.487	0.531	0.704	1.089	1.31E-01	5.22E-02	1.14E-02	3.28E-04	1.089	42wOnly	Over
Pspc1	-0.166	1.055	1.381	0.668	7.52E-01	2.51E-03	1.84E-04	3.12E-02	1.381	2	Normal
Ptbp1	1.211	0.876	1.247	0.151	1.08E-02	3.27E-02	3.32E-03	6.90E-01	1.247	1	Normal
Ptpn3	0.078	0.543	1.083	0.462	8.66E-01	3.17E-02	1.44E-04	5.09E-02	1.083	2	Normal
Ptprd	-0.367	-0.474	-0.739	-1.093	2.47E-01	6.98E-02	6.41E-03	2.25E-04	-1.093	42wOnly	Under
Pttg1	-0.051	-3.501	-4.049	-1.934	9.61E-01	7.60E-06	1.40E-06	1.60E-03	-4.049	4	Under
Qpct	-1.071	-1.498	-1.775	-1.439	5.67E-03	9.79E-05	1.34E-05	1.28E-04	-1.775	3	Under
Rab30	-0.998	-2.199	-1.876	-1.629	1.53E-01	8.74E-04	2.84E-03	5.88E-03	-2.199	4	Under
Rab34	0.776	0.958	0.825	1.52	5.88E-02	9.00E-03	1.91E-02	1.52E-04	1.52	42wOnly	Over
Rab3d	0.079	0.65	0.386	1.007	8.74E-01	1.95E-02	1.32E-01	5.53E-04	1.007	42wOnly	Over
Rad51b	-3.397	-3.468	-3.387	-1.011	1.40E-03	4.72E-04	4.63E-04	2.17E-01	-3.468	3	Normal
Rapgef4	-0.542	-1.202	-1.549	-1.728	1.89E-01	1.60E-03	1.10E-04	4.83E-05	-1.728	4	Under
Rarb	-1.533	-1.253	-1.477	-0.785	3.10E-03	6.18E-03	1.52E-03	5.66E-02	-1.533	3	Normal
Rarres1	0.87	1.57	1.556	0.842	1.29E-01	2.72E-03	2.66E-03	6.82E-02	1.57	2	Normal
Rasa2	0.493	0.505	0.366	1.336	2.54E-01	1.47E-01	2.72E-01	5.48E-04	1.336	42wOnly	Over
Rasgrp2	-0.16	0.52	0.673	1.221	6.20E-01	2.49E-02	4.41E-03	2.24E-05	1.221	42wOnly	Over
Rassf4	0.002	0.676	0.191	1.681	9.98E-01	1.40E-01	6.64E-01	8.09E-04	1.681	42wOnly	Over

Rb1cc1	0.055	-0.333	-0.684	-1.52	9.34E-01	2.61E-01	2.68E-02	5.58E-05	-1.52	42wOnly	Under
Rbm12b1	-0.04	-1.773	-1.319	-0.888	9.59E-01	2.90E-05	5.43E-04	9.22E-03	-1.773	4	Normal
Rbm45	0.009	1.7	1.961	0.979	9.95E-01	8.78E-05	1.66E-05	7.14E-03	1.961	2	Normal
Rcan2	-1.559	-2.148	-1.891	0.487	1.71E-02	6.48E-04	1.70E-03	3.58E-01	-2.148	3	Normal
Rdx	-0.3	-0.298	-0.671	-1.15	2.15E-01	1.31E-01	1.90E-03	1.29E-05	-1.15	42wOnly	Under
Retsat	-0.297	-0.961	-1.207	-1.679	6.50E-01	3.41E-02	8.41E-03	5.23E-04	-1.679	4	Under
Rfc3	0.204	1.169	1.155	0.882	6.28E-01	4.50E-04	3.92E-04	3.15E-03	1.169	2	Normal
Rfx4	-1.699	-1.447	-1.371	-2.535	1.23E-02	1.60E-02	1.85E-02	1.38E-04	-2.535	3	Under
Rgs16	-1.39	-1.811	-5.187	-4.165	2.69E-01	7.97E-02	3.56E-05	3.15E-04	-5.187	3	Under
Rnd2	0.128	0.703	0.534	1.519	8.07E-01	1.88E-02	5.78E-02	3.11E-05	1.519	42wOnly	Over
Rnf170	-1.859	-2.033	-2.071	-1.534	1.08E-04	7.60E-06	4.07E-06	1.13E-04	-2.071	3	Under
Robo1	0.743	1.177	1.278	1.519	1.22E-01	6.21E-03	2.99E-03	5.53E-04	1.519	2	Over
Rock1	-0.137	-0.261	-0.524	-1.068	7.12E-01	2.55E-01	2.79E-02	1.17E-04	-1.068	42wOnly	Under
Rorc	1.125	0.674	1.083	1.444	1.29E-01	2.61E-01	7.44E-02	1.76E-02	1.444	42wOnly	Over
Rpa2	0.386	1.086	1.057	0.884	2.60E-01	6.50E-04	6.72E-04	2.42E-03	1.086	2	Normal
Rpa3	0.083	1.221	0.909	0.553	8.44E-01	2.03E-05	3.81E-04	1.37E-02	1.221	2	Normal
Rpap3	-0.051	0.624	1.136	0.86	9.36E-01	4.46E-02	7.48E-04	5.36E-03	1.136	2	Normal
Rps25	0.028	0.744	0.968	1.113	9.63E-01	3.41E-02	6.68E-03	1.87E-03	1.113	42wOnly	Over
Rsrp1	-0.548	-0.834	-1.135	-1.195	2.30E-01	3.10E-02	4.11E-03	2.20E-03	-1.195	4	Under
Rtfdc1	-0.112	-0.992	-0.219	-1.053	8.51E-01	4.08E-03	4.68E-01	1.75E-03	-1.053	42wOnly	Under
Rtn4	-1.346	-0.69	-0.947	-0.075	8.16E-04	3.59E-02	5.00E-03	8.08E-01	-1.346	3	Normal
Rtp4	-0.063	0.88	1.239	0.901	9.20E-01	5.91E-03	2.80E-04	3.31E-03	1.239	2	Normal
S100a4	0.007	0.883	0.579	2.675	9.96E-01	1.06E-01	2.63E-01	5.95E-05	2.675	42wOnly	Over
S100a6	0.989	1.54	0.916	4.009	2.56E-01	3.50E-02	1.80E-01	1.68E-05	4.009	1	Over
S100a8	0.72	2.413	3.498	4.918	6.97E-01	4.68E-02	5.26E-03	2.71E-04	4.918	2	Over
S100a9	1.302	3.102	4.131	5.319	4.24E-01	1.77E-02	2.26E-03	2.13E-04	5.319	2	Over
S1pr3	-1.325	-1.493	-1.743	-0.937	3.74E-03	5.95E-04	9.60E-05	1.26E-02	-1.743	3	Normal
Saa1	2.048	2.756	5.056	3.121	6.26E-02	5.72E-03	1.61E-05	1.50E-03	5.056	1	Over
Saa2	1.577	2.706	5.769	3.406	2.75E-01	2.66E-02	4.67E-05	4.60E-03	5.769	1	Over
Saa3	0.675	2.632	2.825	2.066	2.05E-01	7.60E-06	2.45E-06	8.41E-05	2.825	2	Over
Saa4	1.458	1.691	2.558	0.865	1.58E-02	2.41E-03	3.70E-05	7.70E-02	2.558	1	Normal
Sall1	-1.513	-2.013	-2.413	-1.259	2.24E-04	5.49E-06	5.42E-07	3.29E-04	-2.413	3	Under
Sardh	-0.474	-1.009	-1.01	-0.637	1.78E-01	1.82E-03	1.53E-03	2.55E-02	-1.01	4	Normal
Sat1	0.023	0.678	0.565	1.119	9.60E-01	1.20E-02	2.77E-02	1.56E-04	1.119	42wOnly	Over
Sbk1	-0.37	-1.141	-2.131	-1.034	4.80E-01	6.97E-03	1.87E-05	9.10E-03	-2.131	3	Under
Scara5	3.452	4.558	6.795	3.346	1.31E-02	6.45E-04	7.43E-06	4.98E-03	6.795	1	Over

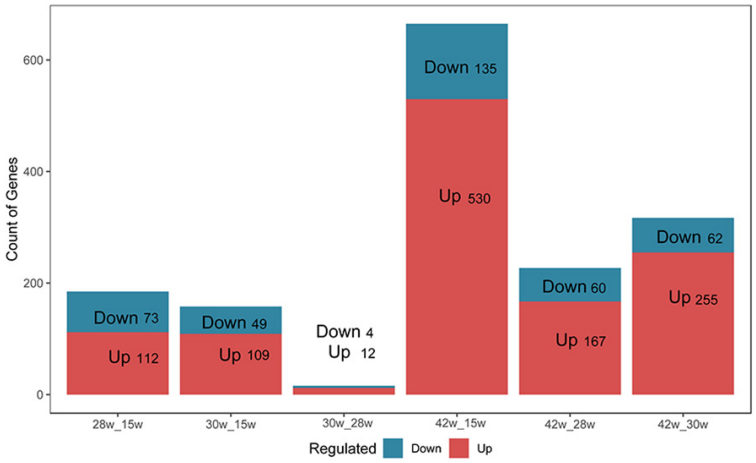
Scd2	0.483	1.885	2.552	4.505	5.22E-01	2.02E-03	9.22E-05	1.15E-07	4.505	2	Over
Sdpr	-0.458	-0.693	-1.029	-0.699	1.54E-01	1.45E-02	5.92E-04	9.22E-03	-1.029	4	Normal
Sdr9c7	0.539	-0.365	-0.417	-1.79	1.74E-01	2.53E-01	1.86E-01	2.33E-05	-1.79	42wOnly	Under
Sec24a	-0.844	-0.929	-1.299	-1.626	6.73E-02	2.23E-02	2.15E-03	2.49E-04	-1.626	3	Under
Selm	-0.228	0.284	-0.285	1.146	7.00E-01	4.33E-01	4.29E-01	3.60E-03	1.146	42wOnly	Over
Serpina12	2.061	2.587	2.943	1.364	7.57E-02	1.26E-02	4.47E-03	1.43E-01	2.943	1	Normal
Serpina4-ps1	3.588	2.045	3.31	0.317	3.53E-02	1.49E-01	2.30E-02	8.17E-01	3.588	1	Normal
Serpina6	-0.935	-0.712	-1.365	-1.289	1.16E-01	1.47E-01	8.28E-03	9.41E-03	-1.365	3	Under
Serpinb1a	-2.464	-1.926	-2.728	-1.209	1.07E-03	3.57E-03	1.28E-04	4.03E-02	-2.728	3	Under
Serpine2	1.239	1.565	2.127	0.416	3.20E-02	3.05E-03	1.63E-04	3.71E-01	2.127	1	Normal
Serpinh1	0.05	-1.101	-1.031	-0.047	9.35E-01	7.28E-04	1.08E-03	8.67E-01	-1.101	4	Normal
Setd7	0.224	0.329	0.281	1.136	5.58E-01	2.22E-01	2.82E-01	2.80E-04	1.136	42wOnly	Over
Sh2d4a	-1.356	-1.404	-1.701	-0.318	1.61E-02	5.97E-03	1.13E-03	4.86E-01	-1.701	3	Normal
Shc1	-0.069	-0.65	-0.584	-1.013	8.93E-01	1.88E-02	2.82E-02	4.91E-04	-1.013	42wOnly	Under
Skp2	0.537	0.523	0.395	1.009	2.18E-01	1.39E-01	2.44E-01	5.40E-03	1.009	42wOnly	Over
Slc10a2	1.373	0.006	1.504	0.406	3.08E-02	9.91E-01	7.15E-03	4.28E-01	1.504	1	Normal
Slc11a2	0.524	0.334	0.893	1.35	3.15E-01	4.00E-01	3.26E-02	2.06E-03	1.35	42wOnly	Over
Slc12a4	0.386	0.555	0.818	1.099	2.63E-01	5.17E-02	5.62E-03	4.20E-04	1.099	42wOnly	Over
Slc16a5	-2.701	-2.832	-3.895	-1.123	1.69E-03	4.59E-04	1.31E-05	9.34E-02	-3.895	3	Normal
Slc19a2	-0.036	-0.28	-0.73	-1.058	9.60E-01	3.98E-01	3.56E-02	3.22E-03	-1.058	42wOnly	Under
Slc22a26	-5.825	-6.399	-6.711	-3.511	7.27E-04	9.70E-05	4.67E-05	1.01E-02	-6.711	3	Under
Slc22a27	-4.422	-4.202	-5.044	-2.884	6.22E-04	3.90E-04	4.42E-05	5.35E-03	-5.044	3	Under
Slc22a5	-0.32	-1.58	-1.716	-2.221	6.78E-01	4.07E-03	1.90E-03	1.63E-04	-2.221	4	Under
Slc25a15	-0.427	-0.701	-0.948	-1.253	2.44E-01	2.43E-02	3.10E-03	2.46E-04	-1.253	42wOnly	Under
Slc25a25	-0.281	-1.307	-0.685	-1.799	8.19E-01	5.74E-02	2.86E-01	8.26E-03	-1.799	42wOnly	Under
Slc25a30	-0.483	-1.888	-0.747	-2.291	6.16E-01	7.96E-03	2.38E-01	1.30E-03	-2.291	4	Under
Slc25a37	0.363	0.807	0.619	1.036	1.46E-01	6.55E-04	4.84E-03	5.50E-05	1.036	42wOnly	Over
Slc29a1	-0.443	-0.684	-1.163	-1.287	3.61E-01	7.69E-02	4.13E-03	1.51E-03	-1.287	3	Under
Slc2a9	-0.547	-0.627	-0.996	-1.047	2.05E-01	7.99E-02	7.37E-03	4.09E-03	-1.047	42wOnly	Under
Slc34a2	-0.781	-1.09	-0.832	-0.755	6.26E-02	4.28E-03	2.03E-02	2.80E-02	-1.09	3	Normal
Slc35e3	1.512	1.65	1.886	0.869	4.60E-04	5.10E-05	1.09E-05	9.18E-03	1.886	1	Normal
Slc35g1	0.251	-0.841	-1.18	-0.796	6.02E-01	1.66E-02	1.25E-03	1.54E-02	-1.18	4	Normal
Slc38a2	-0.312	-0.598	-0.339	-1.307	4.24E-01	4.89E-02	2.32E-01	1.61E-04	-1.307	42wOnly	Under
Slc39a1	0.036	0.916	1.111	0.684	9.34E-01	1.77E-04	1.87E-05	1.72E-03	1.111	2	Normal
Slc3a1	0.004	0.641	1.319	0.922	9.96E-01	1.20E-01	3.01E-03	2.29E-02	1.319	2	Normal
Slc41a2	1.319	1.47	3.518	2.08	3.50E-02	8.56E-03	1.57E-06	3.73E-04	3.518	1	Over

Slc44a2	-0.001	0.708	0.345	1.354	9.98E-01	2.97E-02	2.46E-01	1.89E-04	1.354	42wOnly	Over
Slc46a3	-0.03	1.007	1.082	1.172	9.60E-01	1.26E-03	5.18E-04	2.34E-04	1.172	2	Over
Slc5a3	0.429	-1.338	-0.92	-0.439	2.44E-01	1.65E-04	3.93E-03	1.25E-01	-1.338	4	Normal
Slco1a4	-2.354	-3.014	-4.197	-2.431	1.52E-02	1.05E-03	2.89E-05	3.73E-03	-4.197	3	Under
Slfn4	0.074	0.983	1.334	2.522	9.60E-01	2.15E-01	9.15E-02	2.74E-03	2.522	42wOnly	Over
Smc1a	-0.591	-0.604	-0.89	-1.223	4.98E-02	2.23E-02	1.33E-03	6.84E-05	-1.223	42wOnly	Under
Snhg11	2.447	4.231	4.153	3.791	1.66E-04	7.57E-08	1.14E-07	2.05E-07	4.231	2	Over
Socs2	-1.802	-1.941	-2.157	-0.641	5.21E-02	1.77E-02	7.93E-03	3.90E-01	-2.157	3	Normal
Socs3	2.051	1.479	1.999	2.471	1.11E-02	3.41E-02	5.18E-03	7.91E-04	2.471	1	Over
Sowahb	0.29	0.551	1.216	1.632	5.51E-01	1.14E-01	1.43E-03	9.01E-05	1.632	1	Over
Sowahc	0.219	0.369	0.533	1.075	4.81E-01	1.16E-01	2.54E-02	1.10E-04	1.075	42wOnly	Over
Sox9	0.775	0.425	1.135	1.213	9.01E-02	2.54E-01	5.03E-03	2.42E-03	1.213	1	Over
Spata2l	-0.588	-0.667	-1.181	-1.926	2.73E-01	1.24E-01	9.20E-03	1.52E-04	-1.926	3	Under
Spats2	0.351	0.978	0.788	1.245	4.64E-01	1.18E-02	3.16E-02	1.39E-03	1.245	42wOnly	Over
Spc25	0.331	0.848	0.143	1.199	5.44E-01	3.55E-02	7.00E-01	3.13E-03	1.199	42wOnly	Over
Spg20	-0.075	-0.463	-0.52	-1.018	8.93E-01	1.03E-01	6.25E-02	9.05E-04	-1.018	42wOnly	Under
Spp1	-0.526	0.36	0.076	1.66	2.79E-01	3.42E-01	8.37E-01	2.49E-04	1.66	42wOnly	Over
Sptlc2	-0.115	0.488	0.358	1.117	8.18E-01	7.88E-02	1.76E-01	3.15E-04	1.117	42wOnly	Over
Srd5a1	1.297	1.297	1.353	0.652	1.14E-02	5.32E-03	3.32E-03	1.13E-01	1.353	1	Normal
Srebf1	-0.283	1.268	1.033	1.167	7.42E-01	2.07E-02	4.70E-02	2.30E-02	1.268	2	Over
St3gal5	-0.559	-1.323	-2.337	-1.857	4.99E-01	3.65E-02	6.57E-04	3.48E-03	-2.337	3	Under
St3gal6	-2.091	-2.852	-3.033	-1.605	1.69E-03	2.68E-05	1.27E-05	3.94E-03	-3.033	3	Under
St8sia4	0.115	0.997	0.965	2.123	8.66E-01	9.43E-03	9.87E-03	1.29E-05	2.123	42wOnly	Over
Stard4	-0.423	-0.621	-1.078	-1.554	4.81E-01	1.65E-01	1.96E-02	1.33E-03	-1.554	3	Under
Stat3	0.426	0.218	1.279	0.809	1.68E-01	3.71E-01	3.93E-05	2.42E-03	1.279	1	Normal
Steap2	-1.008	-0.553	-1.17	0.582	1.58E-01	3.30E-01	4.71E-02	3.04E-01	-1.17	3	Normal
Steap4	0.697	0.669	1.905	1.211	1.70E-01	1.13E-01	1.18E-04	4.85E-03	1.905	1	Over
Stip1	0.004	-1.363	-0.822	-0.886	9.96E-01	2.26E-05	2.87E-03	1.22E-03	-1.363	4	Normal
Stk10	0.281	0.677	0.475	1.497	5.31E-01	4.25E-02	1.32E-01	1.04E-04	1.497	42wOnly	Over
Stmn1	0.363	0.613	0.146	1.465	5.58E-01	1.64E-01	7.27E-01	1.85E-03	1.465	42wOnly	Over
Stx3	0.167	0.507	0.123	1.838	8.65E-01	3.05E-01	7.97E-01	9.34E-04	1.838	42wOnly	Over
Sult1c2	-1.263	-0.598	-1.598	0.253	8.24E-02	3.09E-01	1.13E-02	6.66E-01	-1.598	3	Normal
Sult1d1	-0.695	-0.491	-1.152	-0.294	8.24E-02	1.41E-01	1.71E-03	3.62E-01	-1.152	3	Normal
Sult2a2	-7.115	-8.932	-8.844	-4.195	1.78E-03	7.31E-05	6.90E-05	2.12E-02	-8.932	3	Under
Sult3a1	-8.145	-8.729	-9.494	-6.209	1.08E-04	7.65E-06	2.45E-06	2.32E-04	-9.494	3	Under
Sult5a1	-1.682	0.128	-0.295	-2.098	1.08E-02	8.13E-01	5.70E-01	5.47E-04	-2.098	3	Under

Susd4	2.199	3.232	2.881	0.33	6.95E-03	8.25E-05	2.34E-04	6.11E-01	3.232	1	Normal
Swap70	-0.406	0.671	0.146	1.014	1.69E-01	9.76E-03	5.30E-01	2.66E-04	1.014	42wOnly	Over
Sybu	-2.099	-2.438	-2.464	0.147	3.74E-03	4.41E-04	3.15E-04	8.00E-01	-2.464	3	Normal
Synpo	-0.943	-0.683	-0.639	1.087	3.56E-02	7.40E-02	8.41E-02	4.80E-03	1.087	42wOnly	Over
Syvn1	-0.07	-1.226	0.108	-1.105	9.36E-01	6.64E-03	7.86E-01	9.01E-03	-1.226	4	Under
Taf7	-0.667	-1.135	-0.809	-1.305	3.62E-02	3.04E-04	4.42E-03	6.45E-05	-1.305	3	Under
Tbc1d19	-0.609	0.357	-0.043	1.042	2.06E-01	3.46E-01	9.09E-01	8.79E-03	1.042	42wOnly	Over
Tbc1d8	0.081	-1.198	-1.29	-1.122	9.24E-01	6.21E-03	3.12E-03	6.55E-03	-1.29	4	Under
Tcf19	0.087	0.806	0.579	1.207	9.01E-01	3.10E-02	9.90E-02	1.56E-03	1.207	42wOnly	Over
Tcf24	-2.625	-3.063	-2.772	-1.003	4.93E-04	2.90E-05	7.94E-05	7.73E-02	-3.063	3	Normal
Tctex1d2	0.103	0.797	0.717	1.096	8.65E-01	1.52E-02	2.30E-02	1.06E-03	1.096	42wOnly	Over
Tecpr2	0.964	0.398	1.172	0.792	3.37E-03	1.38E-01	1.84E-04	4.26E-03	1.172	1	Normal
Tff3	1.619	2.016	3.534	5.024	2.31E-01	7.18E-02	2.96E-03	1.14E-04	5.024	1	Over
Tgfbr2	0.154	0.939	0.506	1.366	6.43E-01	3.34E-04	2.59E-02	8.29E-06	1.366	42wOnly	Over
Tgm1	-1.511	-1.036	-1.085	0.083	2.41E-02	6.97E-02	5.18E-02	8.77E-01	-1.511	3	Normal
Themis2	0.025	0.922	0.611	1.437	9.72E-01	2.06E-02	9.90E-02	5.64E-04	1.437	42wOnly	Over
Tiam2	-0.546	0.945	1.092	0.776	3.59E-01	4.77E-02	2.16E-02	8.39E-02	1.092	2	Normal
Tifa	-0.857	0.603	1.728	1.353	1.20E-01	1.82E-01	7.11E-04	4.09E-03	1.728	2	Over
Tlr13	0.475	0.235	0.541	1.115	3.59E-01	5.44E-01	1.67E-01	6.73E-03	1.115	42wOnly	Over
Tlr2	-0.027	0.697	1.013	1.709	9.74E-01	1.51E-01	3.88E-02	1.19E-03	1.709	2	Over
Tm6sf2	-1.031	-0.949	-0.812	-0.497	2.06E-03	1.78E-03	4.88E-03	5.98E-02	-1.031	3	Normal
Tmem176a	0.125	0.716	1.315	1.705	8.33E-01	3.40E-02	3.81E-04	4.08E-05	1.705	2	Over
Tmem176b	0.103	0.526	0.842	1.195	8.15E-01	3.25E-02	1.25E-03	4.90E-05	1.195	42wOnly	Over
Tmem19	0.665	1.405	1.423	0.3	1.24E-01	6.45E-04	4.53E-04	3.86E-01	1.423	2	Normal
Tmem206	0.648	0.625	0.646	1.255	6.29E-02	3.80E-02	2.88E-02	2.09E-04	1.255	42wOnly	Over
Tmem25	-0.338	-0.69	-1.249	-1.302	5.58E-01	9.65E-02	4.42E-03	2.54E-03	-1.302	3	Under
Tmem43	0.112	1.2	1.16	1.51	8.93E-01	8.09E-03	8.64E-03	9.83E-04	1.51	2	Over
Tmem51	0.003	1.369	1.023	1.309	9.96E-01	5.72E-05	8.90E-04	8.78E-05	1.369	2	Over
Tmem71	-0.101	1.281	1.161	2.29	9.15E-01	9.16E-03	1.44E-02	5.77E-05	2.29	2	Over
Tmem86a	-0.195	1.198	0.91	2.066	8.15E-01	1.39E-02	4.65E-02	1.28E-04	2.066	2	Over
Tmem98	-0.979	-1.269	-0.984	0.196	9.91E-03	5.04E-04	3.58E-03	5.20E-01	-1.269	3	Normal
Tmie	0.118	-0.907	-0.764	-1.036	8.37E-01	7.23E-03	1.82E-02	1.85E-03	-1.036	42wOnly	Under
Tmprss2	-1.509	-1.494	-1.455	0.768	1.43E-02	6.94E-03	7.20E-03	1.20E-01	-1.509	3	Normal
Tmprss4	0.047	0.387	0.762	1.265	9.60E-01	3.56E-01	7.67E-02	4.77E-03	1.265	42wOnly	Over
Tmtc2	-0.984	-0.016	-1.197	-0.391	1.03E-01	9.76E-01	1.94E-02	4.17E-01	-1.197	3	Normal
Tnfaip2	-0.349	0.325	0.94	1.169	5.60E-01	4.30E-01	3.05E-02	7.50E-03	1.169	42wOnly	Over

Tnik	-1.057	-0.919	-0.865	-0.817	8.93E-03	1.02E-02	1.26E-02	1.42E-02	-1.057	3	Normal
Tnip1	0.105	1.031	1.035	1.482	8.84E-01	9.79E-03	8.16E-03	3.92E-04	1.482	2	Over
Tob2	-0.876	-0.844	-1.43	-0.841	1.27E-01	7.99E-02	4.74E-03	6.86E-02	-1.43	3	Normal
Tox	-1.317	-1.245	-1.759	-1.001	3.51E-03	2.36E-03	7.57E-05	7.64E-03	-1.759	3	Under
Tpmt	0.844	1.326	1.129	0.936	3.74E-03	1.55E-05	7.98E-05	4.42E-04	1.326	1	Normal
Tra2a	0.004	-1.235	-0.584	-0.571	9.96E-01	9.34E-06	8.64E-03	7.90E-03	-1.235	4	Normal
Trim24	-1.981	-2.107	-2.63	-1.671	2.27E-04	3.46E-05	2.78E-06	3.15E-04	-2.63	3	Under
Trim30a	-0.282	0.406	0.527	1.045	3.81E-01	1.06E-01	3.58E-02	2.57E-04	1.045	42wOnly	Over
Trip4	1.036	1.292	1.147	0.478	1.92E-03	8.58E-05	2.61E-04	6.91E-02	1.292	1	Normal
Trp53inp2	-0.476	-1.452	-1.118	-1.585	3.45E-01	1.17E-03	7.16E-03	3.58E-04	-1.585	4	Under
Tsc22d1	0.411	1.484	0.675	1.155	3.72E-01	3.94E-04	5.77E-02	2.20E-03	1.484	1	Over
Tsc22d3	-0.371	-0.914	-1.157	-1.559	6.75E-01	1.15E-01	4.51E-02	7.68E-03	-1.559	4	Under
Tshz2	-0.026	0.743	1.099	0.932	9.60E-01	2.72E-03	5.26E-05	2.85E-04	1.099	2	Normal
Tspan17	0.325	0.555	0.152	1.182	5.58E-01	1.58E-01	6.87E-01	3.86E-03	1.182	42wOnly	Over
Tspan4	0.138	0.408	0.689	1.153	8.27E-01	2.32E-01	4.72E-02	1.78E-03	1.153	42wOnly	Over
Tstd1	0.106	0.637	1.02	0.781	8.94E-01	1.17E-01	1.46E-02	4.75E-02	1.02	2	Normal
Ttc39c	2.892	3.523	2.972	1.127	4.67E-04	1.55E-05	8.76E-05	6.75E-02	3.523	1	Normal
Twf2	-0.042	0.408	0.352	1.287	9.42E-01	1.38E-01	1.85E-01	9.48E-05	1.287	42wOnly	Over
Txnip	0.135	-0.182	-1.586	-1.482	9.20E-01	7.73E-01	1.61E-02	1.90E-02	-1.586	3	Under
Uap1l1	0.237	1.172	0.736	2.37	8.33E-01	6.09E-02	2.10E-01	4.90E-04	2.37	42wOnly	Over
Ubd	0.273	1.928	2.255	4.408	8.55E-01	1.98E-02	6.52E-03	1.87E-05	4.408	2	Over
Ube2b	-0.278	-0.575	-0.759	-1.046	3.82E-01	2.61E-02	4.06E-03	2.39E-04	-1.046	42wOnly	Under
Ubqln4	-0.23	-1.368	-0.51	-0.378	4.32E-01	7.60E-06	2.50E-02	8.05E-02	-1.368	4	Normal
Ufsp1	-0.046	1.127	-0.091	0.609	9.36E-01	3.56E-04	7.21E-01	2.18E-02	1.127	1	Normal
Ugdh	0.729	0.793	0.944	1.013	1.44E-02	3.56E-03	6.87E-04	3.24E-04	1.013	42wOnly	Over
Umps	-0.723	-0.662	-1.036	-0.351	6.95E-03	5.74E-03	8.76E-05	9.87E-02	-1.036	3	Normal
Unc119	0.673	0.934	1.108	1.106	3.86E-02	2.02E-03	3.62E-04	3.24E-04	1.108	1	Over
Usp40	-0.449	-0.565	-1.143	-0.466	1.91E-01	5.08E-02	3.81E-04	8.71E-02	-1.143	3	Normal
Uty	3.159	3.991	3.68	1.749	5.15E-04	1.46E-05	2.89E-05	1.36E-02	3.991	1	Over
Vat1	0.39	0.657	0.82	1.726	5.15E-01	1.33E-01	5.93E-02	4.20E-04	1.726	42wOnly	Over
Vegfc	-0.344	2.269	2.167	1.995	6.36E-01	1.24E-04	1.67E-04	3.31E-04	2.269	2	Over
Vldlr	-2.251	-2.617	-3.274	-1.826	1.29E-02	1.88E-03	1.95E-04	1.50E-02	-3.274	3	Under
Wdfy1	-0.02	2.471	2.144	1.028	9.74E-01	1.68E-06	4.07E-06	4.13E-03	2.471	2	Over
Wdr6	0.024	1.156	0.654	0.905	9.60E-01	8.28E-05	9.51E-03	6.49E-04	1.156	2	Normal
Wfdc17	0.136	0.486	0.597	1.336	8.65E-01	2.37E-01	1.41E-01	2.36E-03	1.336	42wOnly	Over
Wnt5b	-1.01	-1.003	-1.253	-0.286	7.44E-02	4.01E-02	1.09E-02	5.31E-01	-1.253	3	Normal

Wsb1	-0.069	-1.556	-0.527	-0.949	9.25E-01	1.88E-04	1.23E-01	7.68E-03	-1.556	4	Normal
Wwtr1	0.055	0.914	0.761	1.21	8.77E-01	7.10E-05	3.81E-04	5.35E-06	1.21	42wOnly	Over
Xist	-6.209	-7.383	-7.385	-4.481	1.60E-04	7.60E-06	3.88E-06	6.10E-04	-7.385	3	Under
Ybx3	-0.562	-0.958	-1.051	-0.247	2.60E-02	1.51E-04	4.49E-05	2.24E-01	-1.051	4	Normal
Zbp1	-0.797	0.37	1.162	1.35	6.64E-02	2.94E-01	3.08E-03	7.02E-04	1.35	2	Over
Zbtb14	-0.04	1.282	1.021	0.852	9.43E-01	8.61E-05	6.92E-04	2.54E-03	1.282	2	Normal
Zfand4	1.064	1.057	1.284	0.294	3.32E-02	1.66E-02	3.96E-03	4.66E-01	1.284	1	Normal
Zfp810	0.112	2.094	1.931	2.316	8.26E-01	1.09E-06	1.40E-06	1.15E-07	2.316	2	Over
Zkscan3	-0.705	-1.058	-0.99	-1.163	1.08E-02	1.27E-04	2.12E-04	4.90E-05	-1.163	3	Under
Znf41-ps	0.68	2.183	2.073	1.355	6.00E-02	1.61E-06	1.42E-06	1.37E-04	2.183	2	Over



Supplementary Figure 1. DEGs of internal comparison. Histogram exhibited DEGs of among every group comparison. Filled color area is proportion to count of DEGs.

Supplementary Table 3. Log_2 fold change and adjusted *p*-value of all differentially expressed genes among DEN-treated groups

SYMBOL	log_2FC	adj.P.Val	Comparison	Regulated
1700040L02Rik	1.075171	0.043016	28w_15w	Up
1810046K07Rik	1.115668	0.03338	28w_15w	Up
2410089E03Rik	1.089	0.001262	28w_15w	Up
2510019K15Rik	-1.32117	0.011861	28w_15w	Down
9130221J18Rik	-1.7975	0.013653	28w_15w	Down
9530053H05Rik	1.7065	0.006859	28w_15w	Up
Ablim3	-1.52717	0.006734	28w_15w	Down
Abtb2	-1.24848	0.003124	28w_15w	Down
Acot1	-2.2715	0.000651	28w_15w	Down
Acpp	2.258	0.001375	28w_15w	Up
Adamdec1	1.350833	0.04874	28w_15w	Up
Aldh1b1	1.0005	0.025506	28w_15w	Up
Aqp4	1.9385	0.024921	28w_15w	Up
Arhgap30	1.025333	0.038316	28w_15w	Up
Arhgef10	1.149833	0.004857	28w_15w	Up
Arrdc3	1.18684	0.030345	28w_15w	Up
Atp2a2	-1.303	0.000252	28w_15w	Down
AW987390	-1.34373	0.00084	28w_15w	Down
Btnl9	-4.06633	2.52E-05	28w_15w	Down
Camk2b	1.534167	9.79E-05	28w_15w	Up
Car3	3.264984	0.000554	28w_15w	Up
Cav1	1.3065	0.02128	28w_15w	Up
Ccl5	2.063833	0.000455	28w_15w	Up
Cd84	1.533667	0.000399	28w_15w	Up
Cdc42ep5	-1.33533	0.004446	28w_15w	Down
Cdh1	-2.15233	4.21E-05	28w_15w	Down
Cdk5rap1	1.252925	0.000278	28w_15w	Up
Cdkn2c	1.6445	9.32E-05	28w_15w	Up
Cdt1	1.617	0.000399	28w_15w	Up
Cep44	-2.47	4.17E-06	28w_15w	Down
Chka	-1.27184	0.0083	28w_15w	Down
Chordc1	-1.18983	0.000122	28w_15w	Down
Ciapin1	1.180667	7.36E-05	28w_15w	Up
Cirbp	2.599333	2.52E-05	28w_15w	Up
Clec2h	3.598333	0.005171	28w_15w	Up
Clec7a	1.420167	0.003734	28w_15w	Up
Cln8	-1.06467	0.000308	28w_15w	Down
Clpx	-1.87727	0.021416	28w_15w	Down
Cnst	-1.0405	0.008055	28w_15w	Down
Coro1a	1.484333	0.004433	28w_15w	Up
Creld2	-1.971	0.00759	28w_15w	Down
Crem	-1.5245	0.000252	28w_15w	Down
Cry1	-1.63167	0.015593	28w_15w	Down
Csad	-1.3843	0.005985	28w_15w	Down
Ctse	3.528833	7.62E-05	28w_15w	Up
Cyb561	1.278667	0.031381	28w_15w	Up

Cyfip2	1.873833	0.00418	28w_15w	Up
Cyp2g1	1.277416	0.010383	28w_15w	Up
Cyp4a31	-2.39217	0.014099	28w_15w	Down
Cyr61	1.832333	0.038316	28w_15w	Up
Dbp	3.471347	0.040935	28w_15w	Up
Ddx60	1.179167	0.001925	28w_15w	Up
Dnajc10	1.163667	0.001731	28w_15w	Up
Dnase2a	-1.18225	0.002706	28w_15w	Down
Dpy19l3	1.158333	0.031381	28w_15w	Up
Dtx3l	1.435167	0.003425	28w_15w	Up
Eif4e3	1.2025	0.003459	28w_15w	Up
Erdr1	-1.28565	0.011343	28w_15w	Down
Evi2a	1.360187	0.012162	28w_15w	Up
Fam199x	-3.684	2.52E-05	28w_15w	Down
Fam26f	1.441333	0.005171	28w_15w	Up
Fam65b	1.203	0.018298	28w_15w	Up
Fgl2	1.186667	0.027404	28w_15w	Up
Fus	1.115916	3.74E-05	28w_15w	Up
Gigyf2	-1.28383	0.003721	28w_15w	Down
Gm13139	1.159426	6.29E-05	28w_15w	Up
Gm7609	1.030198	0.001346	28w_15w	Up
Gmds	-1.37633	0.008055	28w_15w	Down
Gnpda2	1.4145	8.79E-05	28w_15w	Up
Gpc1	1.354667	0.012877	28w_15w	Up
Hexb	1.049667	0.031589	28w_15w	Up
Hsd3b3	1.831418	0.00334	28w_15w	Up
Hsp90aa1	-1.76617	0.000146	28w_15w	Down
Hspa1b	-3.08667	0.000258	28w_15w	Down
Hspa4l	-1.484	9.32E-05	28w_15w	Down
Hspa8	-1.06762	0.000988	28w_15w	Down
Hspb1	-1.82083	0.007597	28w_15w	Down
Hsph1	-2.7435	2.52E-05	28w_15w	Down
Hyou1	-1.0464	0.021251	28w_15w	Down
Ifi27l2b	1.556333	0.003348	28w_15w	Up
Ifi44	1.042167	0.036086	28w_15w	Up
Ifi47	1.3045	0.005324	28w_15w	Up
Ifit1	1.138167	0.031381	28w_15w	Up
Igfbp1	-1.72158	0.012202	28w_15w	Down
Inhbe	1.114057	0.03975	28w_15w	Up
Ip6k2	-1.208	0.003425	28w_15w	Down
Irf2bp2	-1.35217	0.000372	28w_15w	Down
Irf7	1.3015	0.000252	28w_15w	Up
Irs2	-1.34033	0.02128	28w_15w	Down
Kif1b	-1.031	0.008678	28w_15w	Down
Lars2	-1.63767	7.62E-05	28w_15w	Down
Lcn2	2.715667	0.047653	28w_15w	Up
Lonrf3	-1.30938	0.021371	28w_15w	Down
Lrtm1	1.153158	0.000742	28w_15w	Up
Lurap1l	-1.61117	2.58E-05	28w_15w	Down

Maf	1.3585	0.000252	28w_15w	Up
Mbd1	-1.39054	0.004786	28w_15w	Down
Meg3	1.894	0.04874	28w_15w	Up
Meiob	1.379667	0.000252	28w_15w	Up
Mettl20	-1.5245	0.000252	28w_15w	Down
Mid1	-1.00462	0.007992	28w_15w	Down
Mpeg1	1.0125	0.021663	28w_15w	Up
Mpp4	-1.8655	0.0012	28w_15w	Down
Mr1	1.324833	0.013653	28w_15w	Up
Ms4a4b	1.787833	0.000358	28w_15w	Up
Msr1	1.042333	0.031581	28w_15w	Up
Mthfr	-1.22109	0.035311	28w_15w	Down
Mtnr1a	1.195	0.031589	28w_15w	Up
Ndufab1	-1.46383	0.000399	28w_15w	Down
Nedd4l	-1.31041	0.000545	28w_15w	Down
Nfil3	-1.75315	0.006239	28w_15w	Down
Nmnat1	1.341667	0.000577	28w_15w	Up
Nnt	1.10612	0.000151	28w_15w	Up
Oasl1	1.118667	0.002314	28w_15w	Up
Olfm3	1.407833	0.003721	28w_15w	Up
Orm2	2.588333	0.004009	28w_15w	Up
Orm3	2.437167	0.000455	28w_15w	Up
P4ha1	-1.43067	0.002314	28w_15w	Down
P4ha2	-2.28383	7.73E-05	28w_15w	Down
Pcp4l1	-2.21683	0.009611	28w_15w	Down
Pdzrn3	1.112409	0.00221	28w_15w	Up
Pi4kb	1.600667	2.52E-05	28w_15w	Up
Pla2g15	1.730833	0.000252	28w_15w	Up
Plac8	1.036667	0.028393	28w_15w	Up
Plgrkt	1.123333	0.000446	28w_15w	Up
Plin5	-1.29417	0.019382	28w_15w	Down
Pnrc1	-1.02455	0.008664	28w_15w	Down
Ppbp	1.418326	0.040897	28w_15w	Up
Ppp1r14a	1.196333	0.012185	28w_15w	Up
Ppp1r9a	1.221833	0.004009	28w_15w	Up
Prss8	1.028333	0.009984	28w_15w	Up
Psmb8	1.018333	0.00212	28w_15w	Up
Pspc1	1.221167	0.001851	28w_15w	Up
Pttg1	-3.45	2.52E-05	28w_15w	Down
Rbm12b1	-1.73267	9.79E-05	28w_15w	Down
Rbm45	1.691333	0.000249	28w_15w	Up
Rhox4b	-1.14465	0.037196	28w_15w	Down
Rnf43	1.164106	0.006842	28w_15w	Up
Rpa3	1.138333	0.000109	28w_15w	Up
Rprd2	1.02377	0.002063	28w_15w	Up
S1pr5	1.118264	0.028839	28w_15w	Up
Saa3	1.9565	0.000359	28w_15w	Up
Scd2	1.402333	0.034011	28w_15w	Up
Sdf2l1	-1.15916	0.043016	28w_15w	Down
Serpinh1	-1.15083	0.001146	28w_15w	Down

Slc10a2	-1.36667	0.032581	28w_15w	Down
Slc22a5	-1.25983	0.038511	28w_15w	Down
Slc35g1	-1.0915	0.006745	28w_15w	Down
Slc43a1	1.003381	0.004152	28w_15w	Up
Slc45a3	-1.44643	0.008539	28w_15w	Down
Slc46a3	1.037333	0.002314	28w_15w	Up
Slc5a3	-1.767	2.52E-05	28w_15w	Down
Snhg11	1.7845	0.002597	28w_15w	Up
Srebf1	1.550667	0.013376	28w_15w	Up
St8sia4	1.026931	0.016117	28w_15w	Up
Stau2	1.106371	0.000411	28w_15w	Up
Stip1	-1.36633	7.36E-05	28w_15w	Down
Sult5a1	1.81	0.006734	28w_15w	Up
Swap70	1.077	0.000399	28w_15w	Up
Syvn1	-1.15567	0.022377	28w_15w	Down
Tbc1d8	-1.27817	0.008974	28w_15w	Down
Tiam2	1.4905	0.008144	28w_15w	Up
Tifa	1.46	0.00825	28w_15w	Up
Tmem43	1.087833	0.032581	28w_15w	Up
Tmem51	1.366333	0.000144	28w_15w	Up
Tmem71	1.382167	0.012566	28w_15w	Up
Tmem86a	1.393167	0.011719	28w_15w	Up
Tmie	-1.0255	0.007199	28w_15w	Down
Tra2a	-1.239	2.52E-05	28w_15w	Down
Tsc22d1	1.0725	0.012877	28w_15w	Up
Ubd	1.75967	0.042424	28w_15w	Up
Ubqln4	-1.13783	0.000101	28w_15w	Down
Ufsp1	1.1725	0.000472	28w_15w	Up
Vegfc	2.613	7.62E-05	28w_15w	Up
Wdfy1	2.490667	3.31E-06	28w_15w	Up
Wdr6	1.132	0.000252	28w_15w	Up
Wsb1	-1.48667	0.000643	28w_15w	Down
Zbp1	1.167333	0.008055	28w_15w	Up
Zbtb14	1.321833	0.000146	28w_15w	Up
Zbtb16	-1.12674	0.048512	28w_15w	Down
Zc3h6	1.00585	0.007294	28w_15w	Up
Zfp259	-1.00308	0.039563	28w_15w	Down
Zfp467	1.018685	0.000527	28w_15w	Up
Zfp810	1.982333	3.31E-06	28w_15w	Up
Znf41-ps	1.503333	0.000129	28w_15w	Up
1600002H07Rik	-1.21117	0.03965	30w_15w	Down
2610305D13Rik	1.039333	0.013701	30w_15w	Up
9530053H05Rik	1.673833	0.007385	30w_15w	Up
Ablim3	-1.0875	0.047917	30w_15w	Down
Acot1	-2.34067	0.000599	30w_15w	Down
Acot3	-3.2115	0.008776	30w_15w	Down
Acot4	-1.43983	0.019408	30w_15w	Down
Acpp	2.837	0.000169	30w_15w	Up
Adh4	1.136667	0.002262	30w_15w	Up
Apcs	1.893167	0.0005	30w_15w	Up

Arhgef10	1.979667	2.44E-05	30w_15w	Up
Atp11a	1.994833	0.006662	30w_15w	Up
Bach2	1.095333	0.024294	30w_15w	Up
Btnl9	-3.8505	4.12E-05	30w_15w	Down
Camk2b	1.227667	0.000998	30w_15w	Up
Cav1	1.434	0.010841	30w_15w	Up
Ccl5	1.411833	0.012695	30w_15w	Up
Cdcp1	-1.02708	0.004294	30w_15w	Down
Cdh1	-1.58733	0.000917	30w_15w	Down
Cdk5rap1	1.31708	0.0004	30w_15w	Up
Cep44	-2.53017	4.23E-06	30w_15w	Down
Cidea	3.3635	0.006901	30w_15w	Up
Cirbp	1.880167	0.000769	30w_15w	Up
Clec7a	1.2525	0.009189	30w_15w	Up
Cmpk2	1.048568	0.022581	30w_15w	Up
Cnst	-1.028	0.008197	30w_15w	Down
Coro1a	1.164667	0.022079	30w_15w	Up
Csad	-1.55528	0.00644	30w_15w	Down
Ctsc	1.369111	0.005641	30w_15w	Up
Ctse	3.094833	0.000336	30w_15w	Up
Cyb561	2.163	0.000528	30w_15w	Up
Cyfip2	2.806833	9.02E-05	30w_15w	Up
Cyp39a1	-1.25083	0.032206	30w_15w	Down
Cyp4a31	-2.3465	0.015861	30w_15w	Down
Ddx60	1.398667	0.000413	30w_15w	Up
Dhodh	-1.01433	0.019938	30w_15w	Down
Dnajc10	1.299833	0.000618	30w_15w	Up
Dnajc12	1.423184	0.033044	30w_15w	Up
Dnase2a	-1.21881	0.005715	30w_15w	Down
Dpy19l3	1.818667	0.000998	30w_15w	Up
Dtx3l	1.647333	0.000917	30w_15w	Up
Fam199x	-3.68967	1.93E-05	30w_15w	Down
Fam26f	1.554667	0.002764	30w_15w	Up
Fam65b	1.061333	0.034107	30w_15w	Up
Fgl2	1.057167	0.045044	30w_15w	Up
Fmo2	-1.53367	0.026198	30w_15w	Down
Fndc3b	1.118077	0.011037	30w_15w	Up
Gadd45b	-1.176	0.032459	30w_15w	Down
Gbp3	1.02451	0.023014	30w_15w	Up
Gmds	-1.1885	0.020118	30w_15w	Down
Gnpda2	1.051167	0.001711	30w_15w	Up
Gprin3	-1.1025	0.002661	30w_15w	Down
Hsf2bp	1.384833	0.02906	30w_15w	Up
Hspa1b	-3.27833	0.000185	30w_15w	Down
Hspa4l	-1.23733	0.000637	30w_15w	Down
Hsph1	-1.69583	0.002859	30w_15w	Down
Hykk	-1.02983	0.000832	30w_15w	Down
Ifi27	1.081667	0.000206	30w_15w	Up
Ifi27l2b	1.958667	0.000413	30w_15w	Up
Ifi44	1.421833	0.004449	30w_15w	Up

Ifi47	2.168167	4.23E-05	30w_15w	Up
Ifit1	2.016833	0.00036	30w_15w	Up
Il13ra1	1.159709	0.002916	30w_15w	Up
Il6st	1.0915	0.001585	30w_15w	Up
Irf7	1.293167	0.000352	30w_15w	Up
Irgm1	1.095598	0.005641	30w_15w	Up
Jchain	1.7855	0.028196	30w_15w	Up
Kcnt2	2.038833	0.007044	30w_15w	Up
Klf10	-1.816	0.000708	30w_15w	Down
Lars2	-1.62833	8.85E-05	30w_15w	Down
Lcn2	5.553333	0.000191	30w_15w	Up
Lgals4	-1.26333	0.017278	30w_15w	Down
Lpin1	-2.19467	0.017278	30w_15w	Down
Lrg1	1.148667	0.006662	30w_15w	Up
Lurap1l	-1.1205	0.001171	30w_15w	Down
Ly6e	1.2045	0.002764	30w_15w	Up
Maf	1.394333	0.000244	30w_15w	Up
Meg3	2.6465	0.006092	30w_15w	Up
Meiob	1.6485	4.91E-05	30w_15w	Up
Mgat5	1.098167	0.002601	30w_15w	Up
Mlkl	1.320167	0.001171	30w_15w	Up
Mpeg1	1.314167	0.003177	30w_15w	Up
Mpp4	-1.11067	0.043966	30w_15w	Down
Ms4a4b	1.328667	0.005807	30w_15w	Up
Mtnr1a	1.233667	0.024529	30w_15w	Up
Mycl	-1.12	0.005485	30w_15w	Down
Nek6	1.034	0.010841	30w_15w	Up
Nmnat1	1.3815	0.000528	30w_15w	Up
Nnt	1.259262	0.000392	30w_15w	Up
Oasl1	1.343	0.000439	30w_15w	Up
Obp2a	1.934833	0.029053	30w_15w	Up
Olfm3	1.2345	0.009399	30w_15w	Up
Orm2	4.9895	4.23E-06	30w_15w	Up
Orm3	3.828	4.23E-06	30w_15w	Up
P4ha1	-1.36367	0.003244	30w_15w	Down
P4ha2	-1.81333	0.000815	30w_15w	Down
Pcp4l1	-2.20167	0.009724	30w_15w	Down
Pdgfc	1.081	0.007044	30w_15w	Up
Pi4kb	1.622	2.36E-05	30w_15w	Up
Pisd-ps3	-1.03133	0.018712	30w_15w	Down
Plek	1.220333	0.031821	30w_15w	Up
Ppargc1b	-1.14033	0.031211	30w_15w	Down
Ppp1r14a	1.4395	0.002888	30w_15w	Up
Ppp1r9a	1.146167	0.006511	30w_15w	Up
Prg4	2.0405	5.61E-05	30w_15w	Up
Prtn3	4.062167	0.003765	30w_15w	Up
Psmb8	1.190833	0.000505	30w_15w	Up
Pspc1	1.546833	0.000192	30w_15w	Up
Ptpn3	1.005333	0.000917	30w_15w	Up
Pttg1	-3.99817	4.23E-06	30w_15w	Down

Rapgef4	-1.0075	0.013208	30w_15w	Down
Rbm12b1	-1.27883	0.002262	30w_15w	Down
Rbm45	1.952	5.86E-05	30w_15w	Up
Rgs16	-3.79667	0.002509	30w_15w	Down
Rpap3	1.187333	0.001522	30w_15w	Up
Rsad2	1.330768	0.015688	30w_15w	Up
Rtp4	1.301667	0.000528	30w_15w	Up
S100a8	2.777667	0.047917	30w_15w	Up
Saa1	3.008333	0.006891	30w_15w	Up
Saa2	4.1915	0.003244	30w_15w	Up
Saa3	2.149333	0.000182	30w_15w	Up
Sbk1	-1.76083	0.000477	30w_15w	Down
Scara5	3.3425	0.016102	30w_15w	Up
Scd2	2.069	0.002291	30w_15w	Up
Serpinh1	-1.08117	0.002212	30w_15w	Down
Slc22a5	-1.39617	0.0203	30w_15w	Down
Slc35g1	-1.43017	0.000637	30w_15w	Down
Slc39a1	1.075	9.02E-05	30w_15w	Up
Slc3a1	1.314333	0.007881	30w_15w	Up
Slc41a2	2.199167	0.000769	30w_15w	Up
Slc46a3	1.1115	0.001179	30w_15w	Up
Slc5a3	-1.349	0.000436	30w_15w	Down
Snhg11	1.706333	0.003535	30w_15w	Up
Srebf1	1.316	0.033155	30w_15w	Up
St3gal5	-1.77833	0.015511	30w_15w	Down
Steap4	1.207833	0.015983	30w_15w	Up
Sult5a1	1.386667	0.033155	30w_15w	Up
Tbc1d8	-1.3705	0.00542	30w_15w	Down
Tiam2	1.638	0.003699	30w_15w	Up
Tifa	2.5845	4.23E-05	30w_15w	Up
Tmem176a	1.190333	0.002783	30w_15w	Up
Tmem43	1.047667	0.036443	30w_15w	Up
Tmem51	1.020167	0.002735	30w_15w	Up
Tmem71	1.262333	0.021095	30w_15w	Up
Tmem86a	1.105	0.041683	30w_15w	Up
Tnfaip2	1.289	0.012666	30w_15w	Up
Trim30d	1.098181	0.000216	30w_15w	Up
Tshz2	1.124833	0.000169	30w_15w	Up
Txnip	-1.72083	0.024294	30w_15w	Down
Ubd	1.9825	0.033155	30w_15w	Up
Vegfc	2.511167	0.000129	30w_15w	Up
Wdfy1	2.163333	1.43E-05	30w_15w	Up
Xaf1	1.203831	0.000224	30w_15w	Up
Zbp1	1.9585	6.71E-05	30w_15w	Up
Zbtb14	1.061333	0.001506	30w_15w	Up
Zbtb16	-1.58024	0.018296	30w_15w	Down
Zfp810	1.819	7.07E-06	30w_15w	Up
Znf41-ps	1.3935	0.00036	30w_15w	Up
9130221J18Rik	1.9215	0.049007	30w_28w	Up
Adora1	-1.05383	0.039204	30w_28w	Down

Atp11a	1.984833	0.0425	30w_28w	Up
Atp2a2	1.117833	0.015845	30w_28w	Up
Cdc42ep5	1.280333	0.0425	30w_28w	Up
Crem	1.027167	0.049007	30w_28w	Up
Fbxo21	-1.22117	0.0425	30w_28w	Down
Irf2bp2	1.0085	0.0425	30w_28w	Up
Orm2	2.401167	0.0425	30w_28w	Up
Pdgfc	1.414333	0.014828	30w_28w	Up
Prg4	1.276167	0.0425	30w_28w	Up
Rgs16	-3.37567	0.0425	30w_28w	Down
Slc41a2	2.048167	0.016002	30w_28w	Up
Stat3	1.061833	0.014828	30w_28w	Up
Syvn1	1.333333	0.049007	30w_28w	Up
Ufsp1	-1.21767	0.014828	30w_28w	Down
1500017E21Rik	-1.30341	0.034695	42w_15w	Down
1600002H07Rik	-2.43867	8.07E-05	42w_15w	Down
1700019G17Rik	1.316172	0.000421	42w_15w	Up
1700112E06Rik	1.612762	8.21E-06	42w_15w	Up
1810055G02Rik	-1.15523	0.007252	42w_15w	Down
2210013O21Rik	1.040657	0.001174	42w_15w	Up
2510019K15Rik	-1.40633	0.003199	42w_15w	Down
2810007J24Rik	-2.33487	0.003839	42w_15w	Down
2810417H13Rik	1.077504	0.003741	42w_15w	Up
4833417J20Rik	-1.04033	0.011865	42w_15w	Down
5330417C22Rik	1.259026	0.006427	42w_15w	Up
5830428H23Rik	1.028457	0.000299	42w_15w	Up
6330416G13Rik	1.308833	0.001487	42w_15w	Up
9030619P08Rik	2.285	0.021339	42w_15w	Up
9230104K21Rik	-1.00076	0.01333	42w_15w	Down
9530053H05Rik	1.873	0.001362	42w_15w	Up
A1cf	-1.63833	0.00014	42w_15w	Down
AB124611	1.087166	0.008531	42w_15w	Up
Abcb1a	3.1365	5.29E-05	42w_15w	Up
Abcc1	1.522667	0.000185	42w_15w	Up
Abcc4	1.696571	0.015956	42w_15w	Up
Abcg1	1.1585	0.000288	42w_15w	Up
Abcg3	1.165293	0.004307	42w_15w	Up
Abhd2	1.448833	9.19E-05	42w_15w	Up
Ablim3	-1.436	0.00431	42w_15w	Down
Acot1	-2.1165	0.000664	42w_15w	Down
Acot9	1.453819	0.000575	42w_15w	Up
Acox1	-1.34943	0.008045	42w_15w	Down
Acpp	1.461833	0.014473	42w_15w	Up
Acsl1	-1.45917	0.003748	42w_15w	Down
Actg1	1.045744	0.006454	42w_15w	Up
Adamdec1	2.485667	0.000243	42w_15w	Up
Adamts1	1.065084	0.003948	42w_15w	Up
Adcy7	1.349361	0.000157	42w_15w	Up
Adgb	1.178008	0.003676	42w_15w	Up

Adk	-1.14633	0.003219	42w_15w	Down
Adm	1.418699	0.000296	42w_15w	Up
Adora1	1.080667	0.001275	42w_15w	Up
Afap1	1.19222	0.000104	42w_15w	Up
Afp	2.493	0.04059	42w_15w	Up
Agpat9	1.51868	0.001846	42w_15w	Up
Agphd1	-1.06692	2.29E-05	42w_15w	Down
Ahnak	1.232148	0.000173	42w_15w	Up
AI467606	1.489667	0.001111	42w_15w	Up
AI662270	1.420167	0.00741	42w_15w	Up
Aif1	1.292575	0.00411	42w_15w	Up
Ajuba	1.492215	1.04E-05	42w_15w	Up
Akr1b7	2.605833	0.000727	42w_15w	Up
Akr1c20	-1.3875	0.005308	42w_15w	Down
Aldh18a1	1.573385	0.015375	42w_15w	Up
Aldh1b1	1.515167	0.000468	42w_15w	Up
Alox5ap	1.914333	0.000273	42w_15w	Up
Ampd3	1.112488	0.003537	42w_15w	Up
Angptl4	-2.29983	0.00464	42w_15w	Down
Ankrd1	1.16219	4.25E-05	42w_15w	Up
Anxa1	1.591279	0.000586	42w_15w	Up
Anxa13	1.352686	0.003152	42w_15w	Up
Anxa2	1.989333	0.000281	42w_15w	Up
Anxa3	1.270772	8.23E-06	42w_15w	Up
Ap1s2	1.113016	0.003618	42w_15w	Up
Apcs	1.656	0.000729	42w_15w	Up
Apoa4	1.504444	0.003141	42w_15w	Up
Apobec3	1.011331	0.00806	42w_15w	Up
Ar	1.298579	0.000897	42w_15w	Up
Arhgap15	1.415407	8.21E-06	42w_15w	Up
Arhgap30	1.529667	0.001018	42w_15w	Up
Arid4b	-1.01683	0.002585	42w_15w	Down
Arl2bp	1.4375	0.0055	42w_15w	Up
Arl4c	1.047833	0.000847	42w_15w	Up
Armcx2	1.029424	0.000384	42w_15w	Up
Armcx4	3.487	7.42E-06	42w_15w	Up
Atp11a	1.815667	0.005462	42w_15w	Up
Atp8a1	1.041797	0.000563	42w_15w	Up
AW987390	-1.25	0.000757	42w_15w	Down
Axl	1.099866	0.000132	42w_15w	Up
B4galt6	1.023048	0.000832	42w_15w	Up
Basp1	1.387367	0.002325	42w_15w	Up
Bicc1	1.762768	4.78E-05	42w_15w	Up
Birc5	1.527577	0.004029	42w_15w	Up
Blnk	1.33674	0.008807	42w_15w	Up
Bmper	1.699493	0.000483	42w_15w	Up
Brca1	1.007448	0.009266	42w_15w	Up
Btnl9	-2.139	0.003701	42w_15w	Down
C1qb	1.053254	0.004518	42w_15w	Up
C3ar1	1.016246	0.001648	42w_15w	Up

C8b	-1.41267	0.005205	42w_15w	Down
C920025E04Rik	1.083534	0.025314	42w_15w	Up
Calml4	1.602219	5.27E-05	42w_15w	Up
Camk2d	1.136642	8.78E-05	42w_15w	Up
Camp	1.890158	0.049387	42w_15w	Up
Capg	1.034507	1.14E-05	42w_15w	Up
Car3	-1.93708	0.001887	42w_15w	Down
Casp1	1.522327	0.000249	42w_15w	Up
Casp12	2.315478	0.000171	42w_15w	Up
Casp4	2.129833	0.000491	42w_15w	Up
Cav1	1.301167	0.008839	42w_15w	Up
Cbr3	2.813	0.000267	42w_15w	Up
Cbs	-1.43283	0.000945	42w_15w	Down
Ccdc80	1.230833	0.000358	42w_15w	Up
Ccl5	2.549	2.93E-05	42w_15w	Up
Ccl6	1.405167	0.008127	42w_15w	Up
Ccna2	1.185608	0.010049	42w_15w	Up
Ccnb2	1.146694	0.034262	42w_15w	Up
Ccnd1	1.039245	0.003962	42w_15w	Up
Ccnf	-1.44831	0.005488	42w_15w	Down
Ccr1	1.460224	0.000625	42w_15w	Up
Ccr2	1.074176	0.001148	42w_15w	Up
Ccr5	1.383921	0.000227	42w_15w	Up
Cct4	-1.10017	0.001367	42w_15w	Down
Cd163	-2.54683	0.000358	42w_15w	Down
Cd24a	2.758667	0.000195	42w_15w	Up
Cd34	1.371875	0.000208	42w_15w	Up
Cd36	1.267717	0.000794	42w_15w	Up
Cd44	1.300743	0.009602	42w_15w	Up
Cd48	1.499454	0.001736	42w_15w	Up
Cd52	1.365246	0.000121	42w_15w	Up
Cd53	1.205649	0.002116	42w_15w	Up
Cd5l	1.242833	0.008546	42w_15w	Up
Cd68	1.807023	0.007091	42w_15w	Up
Cd74	1.11761	0.000796	42w_15w	Up
Cd84	1.6875	8.21E-05	42w_15w	Up
Cdc20	1.15754	0.021131	42w_15w	Up
Cdkn2c	1.958667	7.42E-06	42w_15w	Up
Cdt1	1.7215	0.000117	42w_15w	Up
Ceacam1	-1.2055	9.57E-05	42w_15w	Down
Cep192	1.253163	0.000588	42w_15w	Up
Cep44	-1.73833	8.95E-05	42w_15w	Down
Cep55	1.159049	0.02386	42w_15w	Up
Ces2a	-1.34363	0.0256	42w_15w	Down
Cfhr2	-1.20067	0.000859	42w_15w	Down
Cflar	-1.03717	0.000184	42w_15w	Down
Chchd6	1.211984	0.000112	42w_15w	Up
Chi3l3	2.698312	0.006939	42w_15w	Up
Cidea	2.308833	0.030732	42w_15w	Up
Cirbp	1.499167	0.002364	42w_15w	Up

Clca1	1.963054	2.23E-05	42w_15w	Up
Clca3a1	2.3165	1.54E-05	42w_15w	Up
Clcf1	1.9765	5.68E-05	42w_15w	Up
Clec4a2	1.016772	0.025808	42w_15w	Up
Clec4a3	1.908333	0.000987	42w_15w	Up
Clec4n	2.068333	0.0026	42w_15w	Up
Clec7a	2.180833	2.73E-05	42w_15w	Up
Clic1	1.426333	3.75E-05	42w_15w	Up
Cmah	-1.0142	0.018626	42w_15w	Down
Cmtm7	1.012858	0.000485	42w_15w	Up
Col1a2	1.28915	0.002227	42w_15w	Up
Col3a1	1.027503	0.002837	42w_15w	Up
Col4a5	1.235605	0.000175	42w_15w	Up
Col5a2	2.870167	1.40E-05	42w_15w	Up
Col6a3	1.586	7.42E-06	42w_15w	Up
Coro1a	2.093667	8.18E-05	42w_15w	Up
Cotl1	1.527427	0.000162	42w_15w	Up
Cpe	3.614232	0.003755	42w_15w	Up
Cpeb2	-1.15806	0.000983	42w_15w	Down
Cpne8	1.502144	0.002038	42w_15w	Up
Cpox	-1.17967	0.00517	42w_15w	Down
Creld2	-1.694	0.008697	42w_15w	Down
Crem	-1.11767	0.001924	42w_15w	Down
Crip1	2.309	4.20E-06	42w_15w	Up
Csad	-1.85969	0.000249	42w_15w	Down
Csf2rb	1.143557	0.003937	42w_15w	Up
Csf2rb2	1.386833	0.000128	42w_15w	Up
Cstb	1.038	0.004517	42w_15w	Up
Ctla2a	1.671667	0.0009	42w_15w	Up
Ctla2b	1.139167	0.027658	42w_15w	Up
Ctsc	1.486169	0.000487	42w_15w	Up
Cux2	1.603167	0.04059	42w_15w	Up
Cxcl14	1.462516	0.019057	42w_15w	Up
Cxcl9	1.4435	0.008923	42w_15w	Up
Cxcr7	1.31336	0.003635	42w_15w	Up
Cyb561	2.258167	0.000148	42w_15w	Up
Cyba	1.281348	0.00121	42w_15w	Up
Cybb	1.724176	0.000121	42w_15w	Up
Cyfip2	1.940167	0.001306	42w_15w	Up
Cyp1b1	1.008343	0.000384	42w_15w	Up
Cyp2b9	3.736167	0.010033	42w_15w	Up
Cyp2c29	-1.0229	0.016939	42w_15w	Down
Cyp2c55	-1.07933	0.022741	42w_15w	Down
Cyp2d13	-1.36533	0.004963	42w_15w	Down
Cyp2d9	-1.4925	0.04626	42w_15w	Down
Cyp2j5	-1.11483	0.003076	42w_15w	Down
Cyp2u1	-1.1155	0.01457	42w_15w	Down
Cyp4a12a	-3.28817	0.049894	42w_15w	Down
Cyp4a14	-1.43183	0.011059	42w_15w	Down
Cyp4a31	-2.47383	0.004908	42w_15w	Down

Cyp8b1	-2.709	8.36E-05	42w_15w	Down
D17H6S56E-5	1.755561	0.003343	42w_15w	Up
D630004K10Rik	1.118333	0.007602	42w_15w	Up
Ddr1	2.279882	0.000409	42w_15w	Up
Ddx60	1.175167	0.000847	42w_15w	Up
Dmpk	1.190993	0.00491	42w_15w	Up
Dnaja1	-1.2415	0.000468	42w_15w	Down
Dnajc10	1.237833	0.000418	42w_15w	Up
Dnase2a	-1.5444	0.000127	42w_15w	Down
Dnmt1	1.061	0.00033	42w_15w	Up
Dock10	1.352111	0.003012	42w_15w	Up
Dock11	1.376948	0.000724	42w_15w	Up
Dpysl3	1.229665	0.023115	42w_15w	Up
Dram1	1.441561	0.010513	42w_15w	Up
Dtx3l	1.0755	0.010525	42w_15w	Up
Dusp1	-1.20395	0.013101	42w_15w	Down
Egfr	-1.38633	0.027458	42w_15w	Down
Ehd4	1.008836	0.000329	42w_15w	Up
Eid1	1.391594	0.000296	42w_15w	Up
Eif4e3	1.883167	2.07E-05	42w_15w	Up
Elovl3	-4.57867	0.003796	42w_15w	Down
Emilin2	1.097639	0.036533	42w_15w	Up
Emp1	1.925814	0.000176	42w_15w	Up
Emp2	1.113446	0.00252	42w_15w	Up
Emp3	1.091269	0.000314	42w_15w	Up
Enho	-2.05767	0.000627	42w_15w	Down
Epcam	1.7615	0.002359	42w_15w	Up
Eppk1	1.0915	0.003673	42w_15w	Up
Epsti1	1.119817	0.000309	42w_15w	Up
Errfi1	-1.2365	0.001563	42w_15w	Down
Esm1	1.852667	0.035177	42w_15w	Up
Evi2a	2.211833	0.00037	42w_15w	Up
Evl	1.285851	0.004953	42w_15w	Up
Ezr	1.477114	1.04E-05	42w_15w	Up
F13a1	1.581134	0.009365	42w_15w	Up
Fabp4	1.440667	0.000785	42w_15w	Up
Fam102a	1.060128	0.000969	42w_15w	Up
Fam129a	1.216195	0.007484	42w_15w	Up
Fam129b	1.564833	4.78E-05	42w_15w	Up
Fam199x	-1.68733	0.008805	42w_15w	Down
Fam26f	1.9815	0.000129	42w_15w	Up
Fam35a	-1.03291	0.002785	42w_15w	Down
Fam49b	1.212	0.000365	42w_15w	Up
Fam65b	1.472833	0.001753	42w_15w	Up
Fam84b	2.058333	0.000281	42w_15w	Up
Fbn1	1.006318	0.000828	42w_15w	Up
Fcer1g	1.138878	0.006358	42w_15w	Up
Fcgr3	1.077627	0.002909	42w_15w	Up
Fcgr4	1.182525	0.003106	42w_15w	Up
Fermt3	1.331003	0.000928	42w_15w	Up

Fgl2	1.876667	0.000343	42w_15w	Up
Fhit	1.279299	0.000173	42w_15w	Up
Filip1l	1.003128	0.009682	42w_15w	Up
Fkbp7	1.145667	0.000232	42w_15w	Up
Fli1	1.041992	0.001001	42w_15w	Up
Flna	1.114333	0.004517	42w_15w	Up
Fmo2	1.9125	0.002782	42w_15w	Up
Fmo4	1.446833	0.00789	42w_15w	Up
Fpr2	1.0972	0.048872	42w_15w	Up
Frzb	1.594706	3.98E-05	42w_15w	Up
Fstl1	1.342577	0.000234	42w_15w	Up
Fuca2	1.152512	0.001078	42w_15w	Up
Fundc2	1.006243	3.94E-05	42w_15w	Up
Fut8	1.094333	0.000656	42w_15w	Up
Fxyd5	1.051738	0.000255	42w_15w	Up
Fyb	1.31958	0.003343	42w_15w	Up
G6pc	-1.48465	0.029063	42w_15w	Down
G6pdx	1.609833	0.002981	42w_15w	Up
Gabrb3	1.009	3.09E-05	42w_15w	Up
Gas2l3	1.289833	0.005308	42w_15w	Up
Gas6	1.256866	0.001093	42w_15w	Up
Gbp2	1.542133	0.000331	42w_15w	Up
Gbp3	1.377389	0.000338	42w_15w	Up
Gbp8	2.326667	5.68E-05	42w_15w	Up
Gcnt1	1.06247	0.000117	42w_15w	Up
Gigyf2	-1.34333	0.001024	42w_15w	Down
Gipc2	1.608249	0.013585	42w_15w	Up
Glipr1	1.947833	1.14E-05	42w_15w	Up
Glo1	-1.2624	0.000913	42w_15w	Down
Gltp	1.219128	0.001381	42w_15w	Up
Gm10567	1.495648	0.008031	42w_15w	Up
Gm7609	1.598818	9.77E-06	42w_15w	Up
Gna13	1.029102	0.001204	42w_15w	Up
Gnpda2	1.595667	1.21E-05	42w_15w	Up
Golm1	1.33255	0.008737	42w_15w	Up
Gpc1	1.082333	0.021486	42w_15w	Up
Gpr65	1.235719	0.002613	42w_15w	Up
Gprin3	-1.53733	4.64E-05	42w_15w	Down
Gpx7	1.194676	0.009471	42w_15w	Up
Grb10	1.30558	0.010914	42w_15w	Up
Gsn	1.215947	0.047509	42w_15w	Up
Gstm3	1.651333	0.000544	42w_15w	Up
Gyg	1.11644	0.000262	42w_15w	Up
H2-Aa	1.15801	0.001399	42w_15w	Up
H2-Ab1	1.290599	0.001999	42w_15w	Up
H2-DMa	1.104247	0.000564	42w_15w	Up
H2-Eb1	1.528333	0.00099	42w_15w	Up
Hck	1.903167	0.001116	42w_15w	Up
Hcls1	1.025634	0.003907	42w_15w	Up
Herpud1	-1.22668	0.003287	42w_15w	Down

Hexb	2.102667	4.29E-05	42w_15w	Up
Hist1h1c	1.040883	0.00958	42w_15w	Up
Hmgb2	1.437	0.000664	42w_15w	Up
Hmgcs2	-1.72567	0.000206	42w_15w	Down
Hsd3b5	-5.1755	0.003219	42w_15w	Down
Hsf2bp	1.413333	0.01181	42w_15w	Up
Hsp90aa1	-1.16333	0.003199	42w_15w	Down
Hspa1b	-2.64533	0.000626	42w_15w	Down
Hsph1	-1.74517	0.000991	42w_15w	Down
Hykk	-1.5025	7.79E-06	42w_15w	Down
Icam1	1.155833	0.003368	42w_15w	Up
Ier3	1.338799	0.007566	42w_15w	Up
Ier5	1.347833	0.000561	42w_15w	Up
Ifi27l2a	1.381479	0.003047	42w_15w	Up
Ifi27l2b	3.21	8.54E-07	42w_15w	Up
Ifi30	1.373167	0.000746	42w_15w	Up
Ifi44	1.671833	0.0005	42w_15w	Up
Ifi47	1.268167	0.00279	42w_15w	Up
Ifit1	1.6825	0.000786	42w_15w	Up
Ifit2	2.154833	8.07E-05	42w_15w	Up
Ifitm6	2.424667	0.004979	42w_15w	Up
Ift74	1.031536	5.27E-05	42w_15w	Up
Igfbp2	-1.3015	0.002249	42w_15w	Down
Igfbp5	1.25978	0.005239	42w_15w	Up
Ighg	3.719667	0.001541	42w_15w	Up
Ighg2c	2.90421	0.0018	42w_15w	Up
Ighm	2.286	0.009677	42w_15w	Up
Igj	2.24924	0.002119	42w_15w	Up
Igk	1.459333	0.008386	42w_15w	Up
Igkv8-30	2.015398	0.003407	42w_15w	Up
Igsf6	1.259002	0.005592	42w_15w	Up
Igtp	1.00873	0.008643	42w_15w	Up
Ikbip	1.202833	0.002194	42w_15w	Up
Ikzf1	1.250107	0.00121	42w_15w	Up
Il15	1.094681	6.29E-05	42w_15w	Up
Il2rg	1.440918	0.000591	42w_15w	Up
Il33	1.6525	2.41E-05	42w_15w	Up
Ildr2	1.898	0.000117	42w_15w	Up
Incenp	1.100258	0.001152	42w_15w	Up
Ip6k2	-1.08217	0.003219	42w_15w	Down
Iqgap1	1.716667	3.09E-05	42w_15w	Up
Irak3	1.194616	0.023573	42w_15w	Up
Irf7	1.4775	3.52E-05	42w_15w	Up
Irg1	1.025327	0.033817	42w_15w	Up
Irs2	-1.12717	0.024252	42w_15w	Down
Isyna1	1.682833	0.009081	42w_15w	Up
Itga6	2.305833	0.001305	42w_15w	Up
Itgal	1.077885	0.02359	42w_15w	Up
Itgb2	1.699905	0.001715	42w_15w	Up
Jag1	1.028248	3.52E-05	42w_15w	Up

Jak1	-1.14617	0.008478	42w_15w	Down
Jchain	2.552667	0.001018	42w_15w	Up
Kcne3	1.406822	0.000175	42w_15w	Up
Kcnt2	1.789833	0.007602	42w_15w	Up
Kctd12	1.102801	0.00179	42w_15w	Up
Keg1	-1.58811	0.005864	42w_15w	Down
Klf10	-1.7225	0.000516	42w_15w	Down
Klf15	-1.09583	0.00186	42w_15w	Down
Klf6	1.300016	0.003963	42w_15w	Up
Klf9	-1.16513	0.000155	42w_15w	Down
Krt19	1.394056	0.018422	42w_15w	Up
Lair1	1.151984	0.000321	42w_15w	Up
Lama3	-1.31067	0.008028	42w_15w	Down
Laptm5	1.447405	0.000771	42w_15w	Up
Lcn2	6.206833	2.64E-05	42w_15w	Up
Lcp2	1.081277	0.00414	42w_15w	Up
Lgals1	1.193167	0.003219	42w_15w	Up
Lgals3	2.271167	0.000177	42w_15w	Up
Lgals4	-1.2175	0.009623	42w_15w	Down
Lgmn	1.303671	0.000913	42w_15w	Up
Lifr	-1.30317	0.008386	42w_15w	Down
Lpcat2	1.064314	0.000791	42w_15w	Up
Lpin1	-2.36333	0.004731	42w_15w	Down
Lpin2	-1.07517	0.017336	42w_15w	Down
Lpl	1.9285	0.002568	42w_15w	Up
Lpxn	1.141265	0.000504	42w_15w	Up
Lrp6	-1.0965	0.000134	42w_15w	Down
Lrtm2	1.041405	0.000507	42w_15w	Up
Lum	1.5515	0.000117	42w_15w	Up
Lurap1l	-1.71483	7.42E-06	42w_15w	Down
Ly6a	1.006246	0.003384	42w_15w	Up
Ly6d	3.919833	0.001114	42w_15w	Up
Ly6e	1.807833	2.53E-05	42w_15w	Up
Lyz1	1.297232	0.00066	42w_15w	Up
Lyz2	1.436943	0.001301	42w_15w	Up
Maf	1.004	0.001959	42w_15w	Up
Mafb	-1.88817	0.005525	42w_15w	Down
Magt1	-1.123	0.000656	42w_15w	Down
Mal	1.390277	8.21E-06	42w_15w	Up
Map7d1	1.013833	0.000281	42w_15w	Up
Marcks	1.091462	0.000242	42w_15w	Up
Mbd1	-1.01401	0.000947	42w_15w	Down
Mbnl3	1.178479	0.00044	42w_15w	Up
Mcm10	-1.1135	0.003148	42w_15w	Down
Mcm3	1.200164	0.000348	42w_15w	Up
Mcm4	1.028602	0.002014	42w_15w	Up
Mcm5	1.803167	0.001541	42w_15w	Up
Mcm6	1.763833	0.00404	42w_15w	Up
Me2	1.450751	0.013608	42w_15w	Up
Mecom	1.036361	0.000262	42w_15w	Up

Mettl20	-1.42833	0.000243	42w_15w	Down
Mfge8	1.542936	0.00389	42w_15w	Up
Mki67	1.799688	0.001399	42w_15w	Up
Mlkl	2.063167	7.42E-06	42w_15w	Up
Mmd2	1.724688	0.001619	42w_15w	Up
Mmp13	1.574452	0.027472	42w_15w	Up
Mpeg1	1.648333	0.000184	42w_15w	Up
Mpp4	-1.80783	0.000729	42w_15w	Down
Mr1	1.178167	0.012267	42w_15w	Up
Ms4a4b	2.226667	2.07E-05	42w_15w	Up
Ms4a4c	1.311333	0.004986	42w_15w	Up
Ms4a6b	1.571722	0.000339	42w_15w	Up
Ms4a6d	1.495592	0.000985	42w_15w	Up
Ms4a7	1.591702	0.002933	42w_15w	Up
Msr1	1.681833	0.000359	42w_15w	Up
Mtmr11	2.17687	0.000321	42w_15w	Up
Mup10	-3.5055	0.003199	42w_15w	Down
Mup3	-2.94751	0.00826	42w_15w	Down
Mup5	-1.72504	0.012113	42w_15w	Down
Mvp	1.2705	0.000664	42w_15w	Up
Myh9	1.051167	0.000161	42w_15w	Up
Naaa	1.062796	0.000249	42w_15w	Up
Naip2	1.153236	0.001441	42w_15w	Up
Ncapg2	1.040396	0.001683	42w_15w	Up
Ncf4	1.013152	0.003833	42w_15w	Up
Nckap1l	1.5885	0.000404	42w_15w	Up
Ncoa7	1.043351	0.007375	42w_15w	Up
Nedd9	1.086368	0.000113	42w_15w	Up
Nfkbie	1.45	0.00014	42w_15w	Up
Nid1	1.921333	0.000184	42w_15w	Up
Nipa1	1.343342	0.003251	42w_15w	Up
Nlrc5	1.02106	3.91E-05	42w_15w	Up
Nlrp12	-1.81037	0.000991	42w_15w	Down
Nod1	1.0585	0.000288	42w_15w	Up
Npdc1	1.178959	0.024518	42w_15w	Up
Nqo1	1.402655	0.000133	42w_15w	Up
Ntf3	1.411433	0.002491	42w_15w	Up
Ntrk2	1.100508	0.003112	42w_15w	Up
Nucb2	1.031219	0.032719	42w_15w	Up
Nusap1	1.304156	0.00987	42w_15w	Up
Nxpe2	-1.51817	0.002782	42w_15w	Down
Nxpe4	1.023176	0.000209	42w_15w	Up
Oasl1	1.063667	0.001449	42w_15w	Up
Oasl2	1.672667	0.000273	42w_15w	Up
Orm2	5.328167	9.21E-07	42w_15w	Up
Orm3	4.853	9.51E-08	42w_15w	Up
Osbpl3	1.582333	0.003078	42w_15w	Up
Osmr	1.221167	0.001449	42w_15w	Up
Oxct1	1.227858	0.000171	42w_15w	Up
P2rx7	1.002807	0.007203	42w_15w	Up

Pak1	1.372748	0.003531	42w_15w	Up
Pbk	1.001553	0.025568	42w_15w	Up
Pcdh17	2.055167	0.000199	42w_15w	Up
Pcf11	-1.2545	0.000117	42w_15w	Down
Pck1	-1.951	0.00627	42w_15w	Down
Pcp4l1	-1.54683	0.035177	42w_15w	Down
Pde4b	1.226568	0.020827	42w_15w	Up
Pde4d	1.2425	0.001571	42w_15w	Up
Pdgfc	1.108629	0.002374	42w_15w	Up
Pdgfd	1.088823	2.29E-05	42w_15w	Up
Pdgfra	1.126445	0.000226	42w_15w	Up
Pdgfrb	1.30397	8.21E-06	42w_15w	Up
Pdzk1ip1	1.225	0.024748	42w_15w	Up
Pdzrn3	1.157691	0.000734	42w_15w	Up
Pf4	1.302214	0.013059	42w_15w	Up
Pfkp	1.377825	0.025314	42w_15w	Up
Pgm1	1.023115	0.020411	42w_15w	Up
Pilra	1.027432	0.008742	42w_15w	Up
Pim3	-2.39417	0.000896	42w_15w	Down
Pip4k2a	1.288053	0.000233	42w_15w	Up
Pitpnm1	1.221667	4.40E-05	42w_15w	Up
Pkm	1.154057	0.001534	42w_15w	Up
Pla2g15	1.194167	0.00334	42w_15w	Up
Pla2g4a	1.141361	0.004008	42w_15w	Up
Pla2g7	1.467663	0.001094	42w_15w	Up
Plac8	2.198167	2.07E-05	42w_15w	Up
Plat	1.167897	0.013553	42w_15w	Up
Plek	2.2025	0.000148	42w_15w	Up
Plgrkt	1.608167	7.42E-06	42w_15w	Up
Plin5	-1.38033	0.00517	42w_15w	Down
Plk2	1.073667	0.005243	42w_15w	Up
Plk3	-1.04426	0.031639	42w_15w	Down
Plk4	1.1195	0.000725	42w_15w	Up
Plp2	1.054466	0.008199	42w_15w	Up
Pls1	1.017301	0.001029	42w_15w	Up
Plscr1	1.0555	0.000418	42w_15w	Up
Pmaip1	1.455282	0.010884	42w_15w	Up
Pmp22	1.269	0.001009	42w_15w	Up
Ppargc1b	-1.15467	0.013432	42w_15w	Down
Ppic	1.151135	0.000262	42w_15w	Up
Ppp1r14a	1.336167	0.002359	42w_15w	Up
Pqlc3	1.089563	0.004125	42w_15w	Up
Prelid2	1.9415	0.000729	42w_15w	Up
Prg4	1.4625	0.000669	42w_15w	Up
Prkd3	-1.2665	0.001063	42w_15w	Down
Prnp	1.100333	0.000677	42w_15w	Up
Prom1	3.341667	4.79E-05	42w_15w	Up
Pros1	1.214333	3.80E-05	42w_15w	Up
Prtn3	3.816	0.002782	42w_15w	Up
Psmb8	1.576	1.21E-05	42w_15w	Up

Psmb9	1.030704	0.000485	42w_15w	Up
Ptbp1	-1.05917	0.010898	42w_15w	Down
Ptger4	1.563348	0.002417	42w_15w	Up
Ptgs1	1.099381	0.00354	42w_15w	Up
Ptprc	1.451222	0.001016	42w_15w	Up
Pttg1	-1.88233	0.002981	42w_15w	Down
Pycard	1.386272	0.000347	42w_15w	Up
Rab31	1.03108	0.003572	42w_15w	Up
Rab8b	1.131453	0.000775	42w_15w	Up
Rac2	1.105406	0.015056	42w_15w	Up
Rad51b	2.385333	0.00865	42w_15w	Up
Rapgef4	-1.18617	0.00169	42w_15w	Down
Rasgrp2	1.3805	7.42E-06	42w_15w	Up
Rassf4	1.678833	0.001219	42w_15w	Up
Rb1cc1	-1.57417	4.40E-05	42w_15w	Down
Rbl1	1.101151	0.003213	42w_15w	Up
Rbm43	1.07655	2.29E-05	42w_15w	Up
Rbm45	1.056428	0.003813	42w_15w	Up
Rbp1	1.371333	0.020276	42w_15w	Up
Rcan2	2.046167	0.001024	42w_15w	Up
Retsat	-1.382	0.003748	42w_15w	Down
Rgs16	-2.77417	0.009969	42w_15w	Down
Rgs19	1.075208	0.00321	42w_15w	Up
Rgs2	1.178175	0.000697	42w_15w	Up
Rhoq	1.069491	0.020046	42w_15w	Up
Rnasel	1.025841	0.001312	42w_15w	Up
Rnd2	1.391333	8.18E-05	42w_15w	Up
Rnf145	1.143203	0.000615	42w_15w	Up
Rps25	1.085333	0.00334	42w_15w	Up
Rragd	1.980485	0.008362	42w_15w	Up
Rtn4	1.271333	0.000583	42w_15w	Up
Rundc3b	1.303863	0.00125	42w_15w	Up
S100a4	2.668	8.07E-05	42w_15w	Up
S100a6	3.02	0.000299	42w_15w	Up
S100a8	4.197833	0.001517	42w_15w	Up
S100a9	4.016833	0.003147	42w_15w	Up
Saa3	1.391	0.00341	42w_15w	Up
Samd9l	1.354199	9.73E-05	42w_15w	Up
Sat1	1.095667	0.000273	42w_15w	Up
Scara3	1.026422	0.002301	42w_15w	Up
Scd2	4.022333	9.21E-07	42w_15w	Up
Sdc4	-1.00117	0.000181	42w_15w	Down
Sdr9c7	-2.32933	1.08E-06	42w_15w	Down
Sectm1a	1.076318	0.001046	42w_15w	Up
Selm	1.374667	0.00132	42w_15w	Up
Selp	1.382244	4.54E-06	42w_15w	Up
Sema3c	1.005144	0.00539	42w_15w	Up
Serpina3k	-1.98334	0.00435	42w_15w	Down
Serpina4-ps1	-3.2715	0.027215	42w_15w	Down
Serpinb1a	1.254667	0.043924	42w_15w	Up

Serpinb6a	1.479848	0.001019	42w_15w	Up
Sesn3	1.01653	0.025044	42w_15w	Up
Sftpd	1.129848	0.000249	42w_15w	Up
Sh2d4a	1.038333	0.033802	42w_15w	Up
Sh3bgrl3	1.380537	0.000233	42w_15w	Up
Shcbp1	1.061669	0.008442	42w_15w	Up
Shroom3	1.125156	0.000687	42w_15w	Up
Sirpa	1.514146	0.000874	42w_15w	Up
Slamf8	1.109961	0.000636	42w_15w	Up
Slc13a3	1.013293	0.010412	42w_15w	Up
Slc16a5	1.5775	0.02895	42w_15w	Up
Slc19a2	-1.022	0.005831	42w_15w	Down
Slc22a30	-1.57294	0.022075	42w_15w	Down
Slc22a5	-1.90167	0.000964	42w_15w	Down
Slc25a24	1.871373	0.000663	42w_15w	Up
Slc25a25	-1.51817	0.029836	42w_15w	Down
Slc25a30	-1.80767	0.009789	42w_15w	Down
Slc25a4	2.237555	0.001015	42w_15w	Up
Slc25a51	-1.2148	0.005452	42w_15w	Down
Slc35g1	-1.04667	0.003766	42w_15w	Down
Slc44a2	1.3545	0.00027	42w_15w	Up
Slc46a3	1.202	0.000267	42w_15w	Up
Slc6a8	1.10707	0.029044	42w_15w	Up
Slco1a1	-4.86017	0.000945	42w_15w	Down
Slfn2	1.031635	0.002302	42w_15w	Up
Slfn4	2.447333	0.004963	42w_15w	Up
Slpi	1.905073	0.003372	42w_15w	Up
Smoc2	1.586051	0.017903	42w_15w	Up
Snca	1.48839	0.007081	42w_15w	Up
Snhg11	1.3445	0.008624	42w_15w	Up
Snhg3	-1.36147	0.04521	42w_15w	Down
Soat1	1.105984	0.001678	42w_15w	Up
Socs5	1.089821	1.80E-05	42w_15w	Up
Sowahb	1.342833	0.000746	42w_15w	Up
Sox4	2.465965	0.000338	42w_15w	Up
Spata2l	-1.33733	0.004495	42w_15w	Down
Spink3	1.851008	0.013672	42w_15w	Up
Spp1	2.1865	2.39E-05	42w_15w	Up
Sptlc2	1.232	0.000185	42w_15w	Up
Srebf1	1.4495	0.00878	42w_15w	Up
St3gal5	-1.29783	0.040326	42w_15w	Down
St8sia4	2.008167	2.12E-05	42w_15w	Up
Stard4	-1.1315	0.01639	42w_15w	Down
Steap2	1.59	0.010659	42w_15w	Up
Stk10	1.216667	0.000987	42w_15w	Up
Stmn1	1.102333	0.017372	42w_15w	Up
Stx3	1.670667	0.002969	42w_15w	Up
Sult1c2	1.515667	0.01703	42w_15w	Up
Sult1e1	1.853772	0.010596	42w_15w	Up
Susd4	-1.86883	0.008923	42w_15w	Down

Swap70	1.42	1.28E-05	42w_15w	Up
Sybu	2.246	0.00097	42w_15w	Up
Synpo	2.03	2.93E-05	42w_15w	Up
Syvn1	-1.03483	0.01806	42w_15w	Down
Tagln2	1.415763	0.001162	42w_15w	Up
Tbc1d19	1.651333	0.000365	42w_15w	Up
Tbc1d24	1.114296	0.001019	42w_15w	Up
Tbc1d8	-1.20233	0.005739	42w_15w	Down
Tcf19	1.119167	0.00404	42w_15w	Up
Tcf24	1.622333	0.008945	42w_15w	Up
Tff3	3.405	0.004322	42w_15w	Up
Tfpi	1.121461	0.000102	42w_15w	Up
Tgfbr2	1.2115	2.80E-05	42w_15w	Up
Tgm1	1.593167	0.007831	42w_15w	Up
Themis2	1.411667	0.001018	42w_15w	Up
Tiam2	1.321667	0.007871	42w_15w	Up
Tifa	2.210167	9.19E-05	42w_15w	Up
Tinag	1.176113	0.018014	42w_15w	Up
Tle1	-1.19266	0.00868	42w_15w	Down
Tlr1	1.23295	0.008715	42w_15w	Up
Tlr2	1.735667	0.001517	42w_15w	Up
Tm4sf4	1.022772	0.00299	42w_15w	Up
Tm6sf1	1.020744	0.004284	42w_15w	Up
Tmc7	-1.25657	0.033194	42w_15w	Down
Tmem173	1.020034	0.001138	42w_15w	Up
Tmem176a	1.580333	8.95E-05	42w_15w	Up
Tmem176b	1.092167	0.000145	42w_15w	Up
Tmem237	1.113104	0.000806	42w_15w	Up
Tmem43	1.3985	0.002685	42w_15w	Up
Tmem45b	1.367169	0.017777	42w_15w	Up
Tmem51	1.306167	0.000117	42w_15w	Up
Tmem71	2.390667	4.29E-05	42w_15w	Up
Tmem86a	2.261167	7.96E-05	42w_15w	Up
Tmem98	1.174833	0.001018	42w_15w	Up
Tmie	-1.15417	0.00116	42w_15w	Down
Tmprss2	2.277333	0.000222	42w_15w	Up
Tmprss4	1.218167	0.00865	42w_15w	Up
Tmsb10	1.805336	2.18E-05	42w_15w	Up
Tnfaip2	1.5175	0.0016	42w_15w	Up
Tnfaip3	1.118411	0.010377	42w_15w	Up
Tnfaip8	1.332095	0.000215	42w_15w	Up
Tnip1	1.377	0.001116	42w_15w	Up
Top2a	1.262751	0.004913	42w_15w	Up
Treml4	1.088495	0.017366	42w_15w	Up
Trim30a	1.3265	3.49E-05	42w_15w	Up
Trim59	1.001193	0.00183	42w_15w	Up
Trp53inp2	-1.1095	0.008386	42w_15w	Down
Tsc22d3	-1.188	0.045177	42w_15w	Down
Tspan4	1.014833	0.006525	42w_15w	Up
Tspan8	3.250866	9.06E-05	42w_15w	Up

Ttc39c	-1.76433	0.008805	42w_15w	Down
Tubb2b	1.241774	0.032578	42w_15w	Up
Twf2	1.329	9.19E-05	42w_15w	Up
Txnip	-1.61683	0.015757	42w_15w	Down
Tyrobp	1.180159	0.002061	42w_15w	Up
Uap1l1	2.132833	0.001781	42w_15w	Up
Ubd	4.135333	3.75E-05	42w_15w	Up
Ube2c	1.114914	0.017137	42w_15w	Up
Ugt2b1	-1.95567	0.024791	42w_15w	Down
Ugt2b38	-2.35862	0.003114	42w_15w	Down
Uhrf1	1.185254	0.003262	42w_15w	Up
Usp18	1.155701	0.002792	42w_15w	Up
Vat1	1.335833	0.004908	42w_15w	Up
Vegfc	2.339	0.000113	42w_15w	Up
Vim	1.406175	0.00092	42w_15w	Up
Vwf	1.21519	0.004228	42w_15w	Up
Wdfy1	1.047333	0.00517	42w_15w	Up
Wfdc15b	1.938665	0.014146	42w_15w	Up
Wfdc17	1.2	0.007379	42w_15w	Up
Wfdc2	1.28292	0.00045	42w_15w	Up
Wls	1.234882	1.42E-06	42w_15w	Up
Wnt5a	1.034533	0.000507	42w_15w	Up
Wwtr1	1.154667	7.59E-06	42w_15w	Up
Xaf1	1.061421	0.000175	42w_15w	Up
Zbp1	2.1465	1.21E-05	42w_15w	Up
Zbtb16	-1.56647	0.003294	42w_15w	Down
Zeb2	1.000266	0.000353	42w_15w	Up
Zfp704	1.034145	0.00083	42w_15w	Up
Zfp810	2.204167	3.73E-07	42w_15w	Up
Zwilch	1.014125	0.00187	42w_15w	Up
1600002H07Rik	-1.67183	0.006763	42w_28w	Down
1700112E06Rik	1.292919	0.000794	42w_28w	Up
2810007J24Rik	-2.29331	0.019103	42w_28w	Down
5330417C22Rik	1.233057	0.029004	42w_28w	Up
5730414N17Rik	-1.16383	0.008484	42w_28w	Down
A1cf	-1.19133	0.006763	42w_28w	Down
Abcb1a	2.648667	0.001098	42w_28w	Up
Abcc1	1.060833	0.010289	42w_28w	Up
Abhd2	1.461167	0.000585	42w_28w	Up
Abtb2	1.011104	0.028377	42w_28w	Up
Acsl1	-1.04717	0.048004	42w_28w	Down
Afap1	1.106304	0.001556	42w_28w	Up
Ahnak	1.229933	0.001469	42w_28w	Up
Akr1b7	2.4955	0.003368	42w_28w	Up
Alox5ap	1.084	0.035618	42w_28w	Up
Ankrd1	1.051361	0.000927	42w_28w	Up
Anxa2	1.872667	0.001868	42w_28w	Up
Aox3	-1.04933	0.023406	42w_28w	Down
Aqp4	-1.68367	0.040861	42w_28w	Down
Armcx4	2.300667	0.001729	42w_28w	Up

Atp11a	1.805667	0.013928	42w_28w	Up
B4galt6	1.073372	0.003924	42w_28w	Up
Bbox1	-1.00083	0.010483	42w_28w	Down
Bicc1	1.718203	0.0006	42w_28w	Up
Bmper	1.343162	0.014695	42w_28w	Up
Btnl9	1.927333	0.01655	42w_28w	Up
C8b	-1.39167	0.013976	42w_28w	Down
Calml4	1.052872	0.010478	42w_28w	Up
Car3	-2.21637	0.025652	42w_28w	Down
Casp12	2.134361	0.002276	42w_28w	Up
Casp4	1.925333	0.003596	42w_28w	Up
Cbr3	2.083	0.008976	42w_28w	Up
Cbs	-1.23333	0.008484	42w_28w	Down
Ccdc80	1.075	0.003596	42w_28w	Up
Ccl6	1.278333	0.028933	42w_28w	Up
Ccnd2	1.110782	1.47E-05	42w_28w	Up
Ccr1	1.134874	0.020295	42w_28w	Up
Ccr5	1.072327	0.010019	42w_28w	Up
Cd163	-1.629	0.023154	42w_28w	Down
Cd24a	2.255333	0.003614	42w_28w	Up
Cd34	1.06486	0.009514	42w_28w	Up
Cdcp1	1.014754	0.005237	42w_28w	Up
Cdh1	1.876	0.000585	42w_28w	Up
Ceacam1	-1.0675	0.0012	42w_28w	Down
Celsr1	1.141077	0.012467	42w_28w	Up
Cers6	1.107167	0.003202	42w_28w	Up
Cirbp	-1.10017	0.035065	42w_28w	Down
Clca1	1.392789	0.003924	42w_28w	Up
Clca3a1	1.650667	0.001784	42w_28w	Up
Clcf1	1.426333	0.003736	42w_28w	Up
Cldn7	1.20298	0.011971	42w_28w	Up
Col4a5	1.273384	0.00115	42w_28w	Up
Col5a2	1.861333	0.003232	42w_28w	Up
Col6a3	1.334833	0.000354	42w_28w	Up
Cpe	3.189703	0.033257	42w_28w	Up
Cpne8	1.05	0.033739	42w_28w	Up
Crip1	1.848667	0.000354	42w_28w	Up
Ctla2a	1.216167	0.02029	42w_28w	Up
Ctse	-2.38317	0.004186	42w_28w	Down
Cux2	1.816333	0.038586	42w_28w	Up
Cxcr7	1.225785	0.024903	42w_28w	Up
Cybb	1.069775	0.024903	42w_28w	Up
Cyp2d13	-1.26383	0.018106	42w_28w	Down
Cyp2d9	-1.8865	0.028181	42w_28w	Down
Cyp2u1	-1.36933	0.010259	42w_28w	Down
Cyp4a12a	-4.22383	0.028181	42w_28w	Down
Cyp7b1	-1.718	0.03729	42w_28w	Down
Cyp8b1	-2.65933	0.000591	42w_28w	Down
Ddhd2	-1.26017	0.034181	42w_28w	Down
Ddr1	2.073021	0.005692	42w_28w	Up

Ddx3y	-4.0545	0.021824	42w_28w	Down
Dnm2	-1.02133	0.012496	42w_28w	Down
Dpy19l3	-1.4765	0.007539	42w_28w	Down
Eif2s3y	-3.59767	0.028933	42w_28w	Down
Elovl3	-3.5075	0.037605	42w_28w	Down
Emp1	1.48918	0.008898	42w_28w	Up
Enho	-1.24833	0.037803	42w_28w	Down
Enpp3	-1.20817	0.015546	42w_28w	Down
Epcam	2.078333	0.002223	42w_28w	Up
Fam199x	1.996667	0.007897	42w_28w	Up
Fam84b	1.7645	0.003478	42w_28w	Up
Fbxo21	-1.61467	0.001098	42w_28w	Down
Fmo2	2.676167	0.000724	42w_28w	Up
Fmo3	4.803667	0.016295	42w_28w	Up
Fosl2	1.433667	0.002887	42w_28w	Up
Frzb	1.232942	0.002633	42w_28w	Up
Fstl1	1.155112	0.006433	42w_28w	Up
Fxyd3	1.01813	0.005692	42w_28w	Up
Gas6	1.015611	0.024314	42w_28w	Up
Gbp8	1.4835	0.008976	42w_28w	Up
Glipr1	1.550167	0.000607	42w_28w	Up
Gm10567	1.641283	0.018394	42w_28w	Up
Gmds	1.095333	0.029364	42w_28w	Up
Golm1	1.317403	0.034423	42w_28w	Up
Grb10	1.404265	0.026735	42w_28w	Up
Hexb	1.053	0.027672	42w_28w	Up
Hist2h2be	1.203167	0.002921	42w_28w	Up
Hsd3b5	-4.86983	0.012496	42w_28w	Down
Hykk	-1.45583	0.000164	42w_28w	Down
Ier3	1.311317	0.032405	42w_28w	Up
Ier5	1.143167	0.006359	42w_28w	Up
Ifi27l2b	1.653667	0.002887	42w_28w	Up
Ifit2	1.311333	0.013384	42w_28w	Up
Igfbp2	-1.2645	0.007821	42w_28w	Down
Ighg	2.701667	0.028933	42w_28w	Up
Ighg2c	2.565932	0.02009	42w_28w	Up
Il33	1.3555	0.000874	42w_28w	Up
Iqgap1	1.1465	0.004239	42w_28w	Up
Itga6	1.762167	0.02029	42w_28w	Up
Itih5	1.070205	0.021488	42w_28w	Up
Jak1	-1.12967	0.02029	42w_28w	Down
Jchain	1.666833	0.036458	42w_28w	Up
Kbtbd11	1.022709	0.023834	42w_28w	Up
Kcne3	1.327262	0.002099	42w_28w	Up
Kdm5d	-2.55933	0.01615	42w_28w	Down
Klf6	1.175018	0.03131	42w_28w	Up
Klf9	-1.15672	0.001458	42w_28w	Down
Klhl13	1.168833	0.005907	42w_28w	Up
Krt19	1.980177	0.008898	42w_28w	Up
Krt7	1.213266	0.0006	42w_28w	Up

Lcn2	3.491167	0.011399	42w_28w	Up
Lepr	1.925	0.039146	42w_28w	Up
Lgals1	1.084333	0.014779	42w_28w	Up
Lgals3	1.442	0.015874	42w_28w	Up
Lonrf3	1.528146	0.016442	42w_28w	Up
Lrtm2	1.253858	0.000924	42w_28w	Up
Lum	1.286833	0.002588	42w_28w	Up
Ly6d	3.257	0.011704	42w_28w	Up
Lyz1	1.02635	0.02475	42w_28w	Up
Lyz2	1.087659	0.036765	42w_28w	Up
Mafb	-1.47367	0.043552	42w_28w	Down
Mal	1.05912	0.000924	42w_28w	Up
Mbnl3	1.543313	0.000596	42w_28w	Up
Mcm10	-1.53533	0.001005	42w_28w	Down
Mcm5	1.474667	0.01568	42w_28w	Up
Mcm6	1.335	0.040105	42w_28w	Up
Mfge8	1.347553	0.035729	42w_28w	Up
Mlkl	1.130333	0.005824	42w_28w	Up
Mmp7	1.439482	0.006234	42w_28w	Up
Ms4a6d	1.058641	0.043261	42w_28w	Up
Msln	1.0165	0.001098	42w_28w	Up
Mtmr11	1.798105	0.008898	42w_28w	Up
Mup10	-4.21167	0.002639	42w_28w	Down
Nedd9	1.068292	0.010798	42w_28w	Up
Nid1	1.7315	0.001868	42w_28w	Up
Nipal1	2.358833	0.036458	42w_28w	Up
Nox4	-1.12633	0.023199	42w_28w	Down
Ntf3	1.091423	0.048372	42w_28w	Up
Ntrk2	1.208479	0.008257	42w_28w	Up
Nudt7	-1.83533	0.008976	42w_28w	Down
Nxpe2	-1.4705	0.009229	42w_28w	Down
Oasl2	1.277833	0.007768	42w_28w	Up
Orm2	2.739833	0.003384	42w_28w	Up
Orm3	2.415833	0.001098	42w_28w	Up
Osbpl3	1.110667	0.047148	42w_28w	Up
Osmr	1.704167	0.000516	42w_28w	Up
Oxct1	1.118852	0.045148	42w_28w	Up
P4ha2	1.615333	0.003368	42w_28w	Up
Pak1	1.333375	0.019027	42w_28w	Up
Pcdh17	1.133667	0.035394	42w_28w	Up
Pde8a	-1.0025	0.002639	42w_28w	Down
Pdgfc	1.266833	0.003007	42w_28w	Up
Pkhd1	1.166833	0.010483	42w_28w	Up
Pla2g6	-1.14867	0.028933	42w_28w	Down
Plac8	1.1615	0.013928	42w_28w	Up
Plek	1.0745	0.049656	42w_28w	Up
Ppargc1b	-1.34917	0.012496	42w_28w	Down
Ppp1r9a	-1.01933	0.014779	42w_28w	Down
Prelid2	1.486167	0.013893	42w_28w	Up
Prkd3	-1.82133	0.000354	42w_28w	Down

Prom1	3.763333	0.000164	42w_28w	Up
Pttg1	1.567667	0.021991	42w_28w	Up
Rad51b	2.456333	0.016087	42w_28w	Up
Rb1cc1	-1.18717	0.002593	42w_28w	Down
Rcan2	2.634333	0.000591	42w_28w	Up
Rgs16	-2.35317	0.045359	42w_28w	Down
Rragd	1.843548	0.04478	42w_28w	Up
S100a4	1.792167	0.007795	42w_28w	Up
S100a6	2.469333	0.005276	42w_28w	Up
Scd2	2.62	0.000591	42w_28w	Up
Sdr9c7	-1.425	0.001098	42w_28w	Down
Sema3c	1.290634	0.004968	42w_28w	Up
11-Sep	1.005964	0.005069	42w_28w	Up
Serpinb6a	1.039086	0.045667	42w_28w	Up
Serpine2	-1.14933	0.039146	42w_28w	Down
Serpinh1	1.054	0.003478	42w_28w	Up
Sftpd	1.35204	0.0006	42w_28w	Up
Sh2d4a	1.086	0.045868	42w_28w	Up
Shroom3	1.072955	0.006174	42w_28w	Up
Slc11a2	1.016167	0.036242	42w_28w	Up
Slc16a5	1.708833	0.035618	42w_28w	Up
Slc25a24	1.225447	0.049943	42w_28w	Up
Slco1a1	-4.12117	0.009229	42w_28w	Down
Slco1b2	-1.07299	0.010019	42w_28w	Down
Slpi	1.859892	0.017818	42w_28w	Up
Sowahb	1.081833	0.010472	42w_28w	Up
Sox4	2.216034	0.005384	42w_28w	Up
Spata2l	-1.25833	0.015662	42w_28w	Down
Spp1	1.299833	0.007821	42w_28w	Up
St3gal6	1.247333	0.045148	42w_28w	Up
St8sia4	1.1265	0.010289	42w_28w	Up
Stx3	1.331167	0.027672	42w_28w	Up
Sult2a2	4.736833	0.028933	42w_28w	Up
Sult5a1	-2.22633	0.001868	42w_28w	Down
Susd4	-2.902	0.001098	42w_28w	Down
Sybu	2.5845	0.001098	42w_28w	Up
Synpo	1.770333	0.000609	42w_28w	Up
Tagln2	1.238754	0.015099	42w_28w	Up
Tcf24	2.06	0.00515	42w_28w	Up
Tff3	3.007667	0.021551	42w_28w	Up
Tfrc	1.173421	0.029301	42w_28w	Up
Tgm2	1.030489	0.006619	42w_28w	Up
Tmem19	-1.1055	0.011271	42w_28w	Down
Tmem45b	1.441557	0.044732	42w_28w	Up
Tmem98	1.464667	0.000687	42w_28w	Up
Tmprss2	2.262167	0.001098	42w_28w	Up
Tmsb10	1.087223	0.010684	42w_28w	Up
Tspan8	2.933365	0.001556	42w_28w	Up
Ttc39c	-2.396	0.003202	42w_28w	Down

Ubd	2.479833	0.010024	42w_28w	Up
Uty	-2.24283	0.010092	42w_28w	Down
Vat1	1.068833	0.036458	42w_28w	Up
Vim	1.015148	0.037369	42w_28w	Up
Wdfy1	-1.44333	0.001601	42w_28w	Down
Wfdc2	1.025858	0.013186	42w_28w	Up
Xist	2.902	0.03644	42w_28w	Up
Ypel2	1.219836	0.037164	42w_28w	Up
1600002H07Rik	-1.2275	0.032517	42w_30w	Down
1600029D21Rik	1.180685	0.039243	42w_30w	Up
1700112E06Rik	1.424546	6.79E-05	42w_30w	Up
2510019K15Rik	-1.06483	0.033759	42w_30w	Down
2810007J24Rik	-2.17488	0.017947	42w_30w	Down
2810417H13Rik	1.005958	0.017475	42w_30w	Up
Abcb1a	2.6295	0.001607	42w_30w	Up
Abcc1	1.388167	0.002328	42w_30w	Up
Abcc9	1.138755	0.000776	42w_30w	Up
Abhd2	1.403667	0.00068	42w_30w	Up
Acot3	3.305	0.008431	42w_30w	Up
Acot9	1.050084	0.020143	42w_30w	Up
Acpp	-1.37517	0.03571	42w_30w	Down
Adamdec1	2.281	0.002545	42w_30w	Up
Adh4	-1.12633	0.003884	42w_30w	Down
Adora1	1.201333	0.002545	42w_30w	Up
Afap1	1.014503	0.001776	42w_30w	Up
Agxt	-1.207	0.019475	42w_30w	Down
Ahnak	1.49903	6.74E-05	42w_30w	Up
Akr1b7	2.606167	0.002925	42w_30w	Up
Alas2	-1.34067	0.037481	42w_30w	Down
Alox5ap	1.394167	0.009549	42w_30w	Up
Ampd3	1.037764	0.016804	42w_30w	Up
Anxa1	1.410233	0.005956	42w_30w	Up
Anxa2	1.672833	0.00439	42w_30w	Up
Anxa3	1.204465	4.29E-05	42w_30w	Up
Aox3	-1.06633	0.021348	42w_30w	Down
Arhgef10	-1.18267	0.004999	42w_30w	Down
Armcx4	2.784	0.000409	42w_30w	Up
B4galt5	1.087528	0.019917	42w_30w	Up
B4galt6	1.019141	0.01278	42w_30w	Up
BC024137	-1.00078	0.020152	42w_30w	Down
Bicc1	1.870336	6.74E-05	42w_30w	Up
Birc5	1.162898	0.047307	42w_30w	Up
Blnk	1.132271	0.048051	42w_30w	Up
Bmper	1.548886	0.004042	42w_30w	Up
Brca1	1.007044	0.023539	42w_30w	Up
Btnl9	1.7115	0.029679	42w_30w	Up
C3ar1	1.116356	0.01308	42w_30w	Up
C8a	-2.023	0.01324	42w_30w	Down
C8b	-1.53867	0.0079	42w_30w	Down

Calml4	1.320584	0.001214	42w_30w	Up
Capg	1.283969	0.005363	42w_30w	Up
Car2	1.728167	0.006496	42w_30w	Up
Car3	-1.4288	0.03482	42w_30w	Down
Casp1	1.279374	0.004245	42w_30w	Up
Casp12	2.068391	0.001917	42w_30w	Up
Casp4	1.859833	0.004993	42w_30w	Up
Cbs	-1.40367	0.00412	42w_30w	Down
Ccdc80	1.47	0.000409	42w_30w	Up
Ccl5	1.137167	0.036009	42w_30w	Up
Ccl6	1.203167	0.035566	42w_30w	Up
Ccnd2	1.077868	1.42E-05	42w_30w	Up
Ccnf	-1.21634	0.036841	42w_30w	Down
Ccr1	1.010182	0.025719	42w_30w	Up
Cd24a	3.112667	0.000409	42w_30w	Up
Cd34	1.300421	0.001284	42w_30w	Up
Cd44	1.132021	0.045259	42w_30w	Up
Cd48	1.199726	0.022936	42w_30w	Up
Cd68	1.541128	0.040901	42w_30w	Up
Cdc42ep3	1.04389	0.003663	42w_30w	Up
Cdcp1	1.068828	0.002238	42w_30w	Up
Cdh1	1.311	0.005987	42w_30w	Up
Cdkn2c	1.125	0.004999	42w_30w	Up
Clca1	1.491793	0.001214	42w_30w	Up
Clca3a1	1.625167	0.002545	42w_30w	Up
Clcf1	1.545667	0.002627	42w_30w	Up
Cldn7	1.363236	0.003636	42w_30w	Up
Clec4a3	1.212667	0.037601	42w_30w	Up
Col1a2	1.556428	0.001917	42w_30w	Up
Col3a1	1.417414	0.000732	42w_30w	Up
Col4a5	1.282086	0.000431	42w_30w	Up
Col5a2	1.957167	0.002627	42w_30w	Up
Col5a3	-1.1315	0.002627	42w_30w	Down
Col6a3	1.7505	1.37E-05	42w_30w	Up
Cotl1	1.037389	0.013146	42w_30w	Up
Creld2	-1.47533	0.035036	42w_30w	Down
Crip1	2.317	1.37E-05	42w_30w	Up
Csf2rb2	1.165167	0.002715	42w_30w	Up
Ctla2a	1.178833	0.022678	42w_30w	Up
Ctse	-1.94917	0.014815	42w_30w	Down
Cux2	1.9035	0.030476	42w_30w	Up
Cxcr7	1.664042	0.002238	42w_30w	Up
Cyba	1.016306	0.019646	42w_30w	Up
Cybb	1.076743	0.016769	42w_30w	Up
Cyp17a1	2.960333	0.020023	42w_30w	Up
Cyp2d9	-1.78183	0.033759	42w_30w	Down
Cyp2u1	-1.17083	0.022299	42w_30w	Down
Cyp4a12a	-4.84617	0.013955	42w_30w	Down
Cyp7b1	-1.79767	0.029679	42w_30w	Down

Cyp8b1	-2.26233	0.002429	42w_30w	Down
D17H6S56E-5	1.833148	0.038402	42w_30w	Up
D630004K10Rik	1.369333	0.005294	42w_30w	Up
Ddr1	2.200971	0.002336	42w_30w	Up
Ddx3y	-4.07683	0.020802	42w_30w	Down
Dmpk	1.047077	0.028068	42w_30w	Up
Dnajc12	-1.23763	0.032613	42w_30w	Down
Dpy19l3	-2.13683	0.000565	42w_30w	Down
Ednrb	1.017232	3.24E-05	42w_30w	Up
Egfr	-1.79017	0.014242	42w_30w	Down
Eid1	1.048773	0.010419	42w_30w	Up
Eif2s3y	-3.86067	0.020802	42w_30w	Down
Eif4e3	1.235333	0.004223	42w_30w	Up
Elovl3	-5.08533	0.005294	42w_30w	Down
Emp1	1.717016	0.002048	42w_30w	Up
Emp2	1.125998	0.008053	42w_30w	Up
Emp3	1.155511	0.000732	42w_30w	Up
Enpp3	-1.28417	0.010626	42w_30w	Down
Epcam	2.471167	0.000615	42w_30w	Up
Evi2a	1.201167	0.046302	42w_30w	Up
Ezr	1.38001	6.74E-05	42w_30w	Up
Fabp4	1.368667	0.004273	42w_30w	Up
Fam102a	1.194907	0.001376	42w_30w	Up
Fam117a	1.000338	0.004612	42w_30w	Up
Fam129a	1.079939	0.034998	42w_30w	Up
Fam199x	2.002333	0.007863	42w_30w	Up
Fam84b	2.2735	0.000613	42w_30w	Up
Fbn1	1.15559	0.001007	42w_30w	Up
Fcgr1	1.0355	0.020802	42w_30w	Up
Fcgr3	1.037607	0.012561	42w_30w	Up
Fkbp5	1.358565	0.022143	42w_30w	Up
Fmo2	3.446167	5.03E-05	42w_30w	Up
Fmo3	4.8145	0.016936	42w_30w	Up
Fmo4	1.7835	0.005294	42w_30w	Up
Frk	1.245333	0.021232	42w_30w	Up
Frzb	1.430961	0.00035	42w_30w	Up
Fstl1	1.53753	0.000213	42w_30w	Up
Fxyd3	1.220987	0.000732	42w_30w	Up
G6pdx	1.293833	0.024826	42w_30w	Up
Gas2l3	1.5675	0.004328	42w_30w	Up
Gbp8	1.468333	0.008983	42w_30w	Up
Gja1	1.273294	0.000246	42w_30w	Up
Glipr1	1.7725	0.000163	42w_30w	Up
Glo1	-1.03768	0.013805	42w_30w	Down
Gltp	1.029274	0.015656	42w_30w	Up
Gm10567	1.534692	0.018667	42w_30w	Up
Golm1	1.157657	0.043221	42w_30w	Up
Gpm6a	1.246204	0.00897	42w_30w	Up
Gpx7	1.234406	0.020441	42w_30w	Up

Grb10	1.343556	0.023121	42w_30w	Up
Gsn	1.761789	0.022256	42w_30w	Up
Gusb	1.015333	0.013955	42w_30w	Up
H2-Eb1	1.0585	0.026095	42w_30w	Up
Hes1	1.057167	0.010344	42w_30w	Up
Hexb	1.530667	0.003728	42w_30w	Up
Hist3h2a	1.192077	0.006249	42w_30w	Up
Hmgcs2	-1.0095	0.02587	42w_30w	Down
Hsd3b5	-5.60617	0.005294	42w_30w	Down
Hspa2	1.042935	0.04005	42w_30w	Up
Ier3	1.7251	0.004227	42w_30w	Up
Ifi27l2b	1.251333	0.015789	42w_30w	Up
Ifi30	1.086833	0.011124	42w_30w	Up
Ifit2	1.225	0.020023	42w_30w	Up
Ifitm6	1.882333	0.039333	42w_30w	Up
Igfbp5	1.458451	0.00622	42w_30w	Up
Ighg	2.571833	0.033759	42w_30w	Up
Igsf6	1.097549	0.03143	42w_30w	Up
Il33	1.244833	0.002034	42w_30w	Up
Insc	-1.1885	0.033759	42w_30w	Down
Iqgap1	1.1845	0.00412	42w_30w	Up
Itga6	1.918	0.012856	42w_30w	Up
Kbtbd11	1.120844	0.009695	42w_30w	Up
Kcne3	1.318936	0.001214	42w_30w	Up
Kdm5d	-2.262	0.029679	42w_30w	Down
Klhl13	1.142	0.006685	42w_30w	Up
Krt19	2.158888	0.00322	42w_30w	Up
Krt7	1.20128	0.00018	42w_30w	Up
Lepr	2.3535	0.015658	42w_30w	Up
Lgals3	1.619167	0.008441	42w_30w	Up
Lum	2.022833	3.57E-05	42w_30w	Up
Ly6d	2.649333	0.031221	42w_30w	Up
Ly86	1.099511	0.003856	42w_30w	Up
Lyz1	1.278794	0.003033	42w_30w	Up
Lyz2	1.435417	0.005082	42w_30w	Up
Mal	1.343574	3.24E-05	42w_30w	Up
Mbnl3	1.306244	0.000696	42w_30w	Up
Meg3	-1.79433	0.047067	42w_30w	Down
Meiob	-1.06867	0.004686	42w_30w	Down
Mfge8	1.409164	0.020152	42w_30w	Up
Mki67	1.619902	0.010895	42w_30w	Up
Mmp7	1.480579	0.003438	42w_30w	Up
Ms4a6b	1.018229	0.025109	42w_30w	Up
Ms4a6d	1.192117	0.016769	42w_30w	Up
Ms4a7	1.169389	0.045449	42w_30w	Up
Msln	1.127	0.000565	42w_30w	Up
Msr1	1.089333	0.021367	42w_30w	Up
Mtmr11	1.723893	0.008037	42w_30w	Up
Mup10	-3.454	0.009106	42w_30w	Down

Mup3	-2.84028	0.025872	42w_30w	Down
Mup5	-1.67906	0.03257	42w_30w	Down
Nampt	1.146068	0.000997	42w_30w	Up
Nedd9	1.034526	0.000677	42w_30w	Up
Nid1	1.465333	0.005622	42w_30w	Up
Nipa1	1.225712	0.017693	42w_30w	Up
Nipal1	3.005	0.010593	42w_30w	Up
Nlrp12	-1.44122	0.016804	42w_30w	Down
Nmrk1	1.156371	0.016126	42w_30w	Up
Ntf3	1.441755	0.007407	42w_30w	Up
Ntrk2	1.075507	0.012167	42w_30w	Up
Nudt7	-1.81817	0.008983	42w_30w	Down
Oasl2	1.013667	0.024826	42w_30w	Up
Obp2a	-1.771	0.037961	42w_30w	Down
Osbpl3	1.227333	0.030093	42w_30w	Up
Osmr	1.467333	0.001545	42w_30w	Up
Oxct1	1.04186	0.002865	42w_30w	Up
P4ha2	1.144833	0.023855	42w_30w	Up
Pak1	1.36276	0.012325	42w_30w	Up
Pcdh17	1.506833	0.0079	42w_30w	Up
Pdgfd	1.179561	3.24E-05	42w_30w	Up
Pdgfra	1.033729	0.001974	42w_30w	Up
Pdgfrb	1.03778	0.000232	42w_30w	Up
Pdzk1ip1	1.6605	0.009549	42w_30w	Up
Pfkp	1.53379	0.03161	42w_30w	Up
Pgm1	1.004081	0.04651	42w_30w	Up
Pip4k2a	1.158977	0.0024	42w_30w	Up
Pla2g7	1.273921	0.011398	42w_30w	Up
Plac8	1.2835	0.0079	42w_30w	Up
Plat	1.158066	0.032725	42w_30w	Up
Plp2	1.15179	0.014042	42w_30w	Up
Pls1	1.065487	0.002865	42w_30w	Up
Pmaip1	1.292911	0.045119	42w_30w	Up
Pmp22	1.343333	0.002627	42w_30w	Up
Por	1.035	0.045461	42w_30w	Up
Ppic	1.150001	0.001029	42w_30w	Up
Prelid2	1.442167	0.0161	42w_30w	Up
Prom1	3.627667	0.000123	42w_30w	Up
Ptbp1	-1.0955	0.020388	42w_30w	Down
Ptger4	1.216182	0.03143	42w_30w	Up
Ptgfrn	1.028791	0.000411	42w_30w	Up
Ptgr1	1.065579	0.004609	42w_30w	Up
Pttg1	2.115833	0.004273	42w_30w	Up
Rad51b	2.375833	0.020388	42w_30w	Up
Rassf4	1.4905	0.008431	42w_30w	Up
Rbp1	1.498833	0.023855	42w_30w	Up
Rcan2	2.378167	0.0015	42w_30w	Up
Rhox4b	1.1696	0.03844	42w_30w	Up
Rragd	2.180691	0.013583	42w_30w	Up

Rundc3b	1.104594	0.014544	42w_30w	Up
S100a4	2.096167	0.003157	42w_30w	Up
S100a6	3.093667	0.00142	42w_30w	Up
Saa4	-1.69333	0.006685	42w_30w	Down
Sall1	1.154167	0.004087	42w_30w	Up
Sbk1	1.096833	0.020332	42w_30w	Up
Scara3	1.156932	0.003539	42w_30w	Up
Scara5	-3.44867	0.013955	42w_30w	Down
Scd2	1.953333	0.004993	42w_30w	Up
Sdf2l1	-1.1886	0.043221	42w_30w	Down
Sdr9c7	-1.373	0.001896	42w_30w	Down
Selm	1.431667	0.003776	42w_30w	Up
Selp	1.040567	0.000213	42w_30w	Up
Sema3c	1.515681	0.000732	42w_30w	Up
Serpina3k	-1.65548	0.032998	42w_30w	Down
Serpinb1a	1.518667	0.030476	42w_30w	Up
Serpinb6a	1.43901	0.004928	42w_30w	Up
Serpine2	-1.71133	0.004993	42w_30w	Down
Sftpd	1.280488	0.000232	42w_30w	Up
Sh2d4a	1.3835	0.015198	42w_30w	Up
Sh3bgrl3	1.084051	0.006418	42w_30w	Up
Slc16a5	2.772	0.002627	42w_30w	Up
Slc22a26	3.200167	0.039457	42w_30w	Up
Slc22a3	1.002182	0.007598	42w_30w	Up
Slc25a24	1.714729	0.005136	42w_30w	Up
Slc25a30	-1.54417	0.040654	42w_30w	Down
Slc25a4	1.768082	0.015147	42w_30w	Up
Slc35e3	-1.01733	0.011124	42w_30w	Down
Slc41a2	-1.43767	0.020802	42w_30w	Down
Slc44a2	1.008667	0.008441	42w_30w	Up
Slco1a1	-4.45767	0.005495	42w_30w	Down
Slpi	1.943769	0.009797	42w_30w	Up
Smoc2	1.627781	0.034456	42w_30w	Up
Snca	1.326262	0.033233	42w_30w	Up
Sox4	2.418893	0.001614	42w_30w	Up
Sparc	1.045746	0.001004	42w_30w	Up
Sparcl1	1.184408	0.003637	42w_30w	Up
Spc25	1.056833	0.021379	42w_30w	Up
Spp1	1.5845	0.002545	42w_30w	Up
St3gal6	1.428333	0.023855	42w_30w	Up
St8sia4	1.1585	0.008479	42w_30w	Up
Steap2	1.751833	0.013955	42w_30w	Up
Stk10	1.022667	0.009549	42w_30w	Up
Stmn1	1.319167	0.013955	42w_30w	Up
Stx3	1.714833	0.006685	42w_30w	Up
Sult1c2	1.850833	0.012022	42w_30w	Up
Sult1e1	1.782025	0.030977	42w_30w	Up
Sult2a2	4.649167	0.030093	42w_30w	Up
Sult3a1	3.2845	0.048039	42w_30w	Up
Sult5a1	-1.803	0.0079	42w_30w	Down

Susd4	-2.55117	0.003728	42w_30w	Down
Sybu	2.610167	0.00142	42w_30w	Up
Synpo	1.725833	0.00082	42w_30w	Up
Syvn1	-1.2125	0.0161	42w_30w	Down
Tagln2	1.162671	0.016133	42w_30w	Up
Tbc1d19	1.084833	0.020802	42w_30w	Up
Tcf24	1.768833	0.012856	42w_30w	Up
Timp3	1.021872	4.45E-05	42w_30w	Up
Tmem19	-1.12317	0.010024	42w_30w	Down
Tmem45b	1.345147	0.041841	42w_30w	Up
Tmem71	1.128333	0.033759	42w_30w	Up
Tmem86a	1.156167	0.030012	42w_30w	Up
Tmem98	1.179833	0.003884	42w_30w	Up
Tmprss2	2.2235	0.0015	42w_30w	Up
Tmsb10	1.372098	0.001214	42w_30w	Up
Tnfaip8	1.084064	0.004829	42w_30w	Up
Top2a	1.149963	0.023804	42w_30w	Up
Tspan17	1.0305	0.02604	42w_30w	Up
Tspan8	3.05579	0.000539	42w_30w	Up
Ttc39c	-1.845	0.015827	42w_30w	Down
Tuba1a	1.00903	0.009273	42w_30w	Up
Uap1l1	1.633667	0.023359	42w_30w	Up
Ubd	2.152833	0.020802	42w_30w	Up
Ugt2b1	-1.897	0.046951	42w_30w	Down
Uty	-1.931	0.021379	42w_30w	Down
Vim	1.618687	0.001079	42w_30w	Up
Vwf	1.153987	0.017475	42w_30w	Up
Wdfy1	-1.116	0.008743	42w_30w	Down
Wls	1.204628	7.41E-06	42w_30w	Up
Xist	2.9045	0.033807	42w_30w	Up

Supplementary Table 4. All KEGG signal pathways were enriched with 726 DEGs

ID	Description	GeneRatio	BgRatio	*p* value	p.adjust	q value	Gene ID	Count
mmu00140	Steroid hormone biosynthesis	18/355	89/8613	1.60E-08	4.51E-06	4.14E-06	Comt/Cyp17a1/Cyp2b10/Cyp2b13/Cyp2b9/Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp2d9/Cyp7b1/Hsd17b2/Hsd17b6/Hsd17b7/Hsd3b2/Hsd3b5/Srd5a1	18
mmu00590	Arachidonic acid metabolism	17/355	89/8613	9.80E-08	1.30E-05	1.19E-05	Cbr3/Cyp2b10/Cyp2b13/Cyp2b9/Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp2j5/Cyp2j9/Cyp2u1/Cyp4a12a/Cyp4a14/Cyp4a31/Cyp4f14/Pla2g6	17
mmu00830	Retinol metabolism	17/355	91/8613	1.38E-07	1.30E-05	1.19E-05	Adh4/Aox1/Aox3/Cyp26b1/Cyp2b10/Cyp2b13/Cyp2b9/Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp4a12a/Cyp4a14/Cyp4a31/Hsd17b6/Retsat	17
mmu03320	PPAR signaling pathway	13/355	85/8613	3.98E-05	0.002807685	0.002578165	Acsl1/Angptl4/Cyp4a12a/Cyp4a14/Cyp4a31/Cyp8b1/Fabp4/Hmgcs2/Lpl/Pck1/Plin5/Pparg/Scd2	13
mmu05020	Prion diseases	7/355	34/8613	0.000390789	0.015909669	0.014609102	C6/C8a/C8b/C9/Ccl5/Prnp/Stip1	7
mmu00982	Drug metabolism-cytochrome P450	10/355	68/8613	0.000428752	0.015909669	0.014609102	Adh4/Aox1/Aox3/Fmo1/Fmo2/Fmo3/Fmo4/Gstm3/Gstp1/Gstt3	10
mmu04630	JAK-STAT signaling pathway	17/355	165/8613	0.000440934	0.015909669	0.014609102	Aox1/Aox3/Ccnd1/Csf2ra/Csf2rb/Csf2rb2/Egfr/Il6st/Jak1/Lepr/Lifr/Osmr/Pim1/Prlr/Socs2/Socs3/Stat3	17
mmu05204	Chemical carcinogenesis	12/355	94/8613	0.000451338	0.015909669	0.014609102	Adh4/Cyp2b10/Cyp2b13/Cyp2b9/Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Gstm3/Gstp1/Gstt3	12
mmu00591	Linoleic acid metabolism	8/355	50/8613	0.000906061	0.028389911	0.026069123	Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp2j5/Cyp2j9/Pla2g6	8
mmu01040	Biosynthesis of unsaturated fatty acids	6/355	32/8613	0.001714219	0.048340977	0.044389251	Acot1/Acot2/Acot3/Acot4/Elovl3/Scd2	6
mmu04750	Inflammatory mediator regulation of TRP channels	13/355	127/8613	0.002156893	0.051015158	0.046844826	Camk2b/Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp2j5/Cyp2j9/Cyp4a12a/Cyp4a14/Cyp4a31/Il1r1/Pla2g6	13
mmu04913	Ovarian steroidogenesis	8/355	57/8613	0.002170858	0.051015158	0.046844826	Acot2/Cyp17a1/Cyp2j5/Cyp2j9/Hsd17b2/Hsd17b7/Hsd3b2/Hsd3b5	8
mmu04920	Adipocytokine signaling pathway	9/355	71/8613	0.002412751	0.05233814	0.048059658	Acsl1/Adipor2/Camkk2/Irs2/Lepr/Nfkbie/Pck1/Socs3/Stat3	9
mmu03030	DNA replication	6/355	35/8613	0.00276716	0.055642479	0.051093877	Mcm4/Mcm5/Mcm6/Rfc3/Rpa2/Rpa3	6
mmu00760	Nicotinate and nicotinamide metabolism	6/355	36/8613	0.003207621	0.055642479	0.051093877	Aox1/Aox3/Enpp1/Enpp3/Nmnat1/Nt5e	6
mmu02010	ABC transporters	7/355	48/8613	0.00326076	0.055642479	0.051093877	Abca3/Abcb1a/Abcc1/Abcd2/Abcg1/Abcg2/Defb1	7
mmu00561	Glycerolipid metabolism	8/355	61/8613	0.003354334	0.055642479	0.051093877	Akr1b7/Aldh1b1/Dgat2/Lipc/Lipg/Lpin1/Lpl/Mgll	8
mmu00071	Fatty acid degradation	7/355	50/8613	0.004123131	0.064595722	0.05931522	Acsl1/Adh4/Aldh1b1/Cyp4a12a/Cyp4a14/Cyp4a31/Eci3	7
mmu00062	Fatty acid elongation	5/355	29/8613	0.006067149	0.090049266	0.082688016	Acot1/Acot2/Acot3/Acot4/Elovl3	5
mmu04068	FoxO signaling pathway	12/355	132/8613	0.008158685	0.115037459	0.105633501	Ccnd1/Egfr/Gadd45b/Homer2/Irs2/Pck1/Plk2/Plk4/Setd7/Skp2/Stat3/Tgfbr2	12
mmu04917	Prolactin signaling pathway	8/355	72/8613	0.009224351	0.120205692	0.110379247	Ccnd1/Cyp17a1/Esr1/Prlr/Shc1/Socs2/Socs3/Stat3	8
mmu00240	Pyrimidine metabolism	7/355	58/8613	0.009377749	0.120205692	0.110379247	Dck/Dhodh/Enpp1/Enpp3/Entpd8/Nt5e/Umps	7
mmu04979	Cholesterol metabolism	6/355	49/8613	0.014724714	0.180537798	0.165779389	Angptl4/Apob/Lipc/Lipg/Lpl/Nceh1	6
mmu00480	Glutathione metabolism	7/355	64/8613	0.015718974	0.184697949	0.169599461	G6pdx/Ggct/Gstm3/Gstp1/Gstt3/Nat8/Pgd	7
mmu00260	Glycine, serine and threonine metabolism	5/355	40/8613	0.023271207	0.252403096	0.23176992	Agxt/Alas1/Alas2/Cbs/Sardh	5
mmu00350	Tyrosine metabolism	5/355	40/8613	0.023271207	0.252403096	0.23176992	Adh4/Aox1/Aox3/Comt/Hgd	5

mmu04659	Th17 cell differentiation	9/355	102/8613	0.024486107	0.255743783	0.234837516	H2-Eb1/Hsp90aa1/Il1r1/Il6st/Jak1/Nfkbie/Rorc/Stat3/Tgfbr2	9
mmu00120	Primary bile acid biosynthesis	3/355	16/8613	0.026078453	0.262647281	0.241176675	Cyp39a1/Cyp7b1/Cyp8b1	3
mmu04976	Bile secretion	7/355	72/8613	0.028248118	0.2746886	0.252233653	Abcb1a/Abcg2/Aqp4/Car2/Nceh1/Slc10a2/Slco1a4	7
mmu04110	Cell cycle	10/355	123/8613	0.030285801	0.284686534	0.261414286	Ccnd1/Cdkn2c/Dbf4/Gadd45b/Mcm4/Mcm5/Mcm6/Pttg1/Skp2/Smc1a	10
mmu04142	Lysosome	10/355	124/8613	0.031787686	0.289165402	0.265527021	Arsa/Atp6v0d2/Ctse/Ctso/Gusb/Hexb/Igf2r/Litaf/Pla2g15/Slc11a2	10
mmu00770	Pantothenate and CoA biosynthesis	3/355	18/8613	0.035769942	0.313662363	0.28802143	Enpp1/Enpp3/Pank1	3
mmu04060	Cytokine-cytokine receptor interaction	19/355	296/8613	0.03670517	0.313662363	0.28802143	Bmp2/Ccl5/Ccl6/Clcf1/Csf2ra/Csf2rb/Csf2rb2/Cxcl1/Cxcl10/Cxcl9/Il1r1/Il33/Il6st/Inhbb/Lepr/Lifr/Osmr/Prlr/Tgfbr2	19
mmu05205	Proteoglycans in cancer	14/355	204/8613	0.04230251	0.350861994	0.322180107	Camk2b/Cav1/Ccnd1/Egfr/Esr1/Flna/Gpc1/Iqgap1/Lum/Rdx/Rock1/Stat3/Tlr2/Wnt5b	14
mmu05226	Gastric cancer	11/355	150/8613	0.045429873	0.358188118	0.328907342	Abcb1a/Ccnd1/Cdh1/Egfr/Fgf1/Gadd45b/Lrp6/Rarb/Shc1/Tgfbr2/Wnt5b	11
mmu04726	Serotonergic synapse	10/355	132/8613	0.045726143	0.358188118	0.328907342	Cyp2c37/Cyp2c38/Cyp2c39/Cyp2c55/Cyp2c68/Cyp2d9/Cyp2j5/Cyp2j9/Gabrb3/Gnai1	10
mmu00520	Amino sugar and nucleotide sugar metabolism	5/355	49/8613	0.050098203	0.381829548	0.350616158	Gmds/Gnpda2/Hexb/Uap1l1/Ugdh	5
mmu00230	Purine metabolism	10/355	136/8613	0.054045796	0.401076694	0.368289909	Adk/Dck/Enpp1/Enpp3/Entpd8/Gda/Nt5e/Papss2/Pde4d/Pde8a	10
mmu03430	Mismatch repair	3/355	22/8613	0.059866931	0.43288396	0.39749703	Rfc3/Rpa2/Rpa3	3
mmu04934	Cushing syndrome	11/355	159/8613	0.063912194	0.441455276	0.405367667	Camk2b/Ccnd1/Cdkn2c/Cyp17a1/Egfr/Gnai1/Hsd3b2/Hsd3b5/Nceh1/Pde8a/Wnt5b	11
mmu05216	Thyroid cancer	4/355	37/8613	0.064390015	0.441455276	0.405367667	Ccnd1/Cdh1/Gadd45b/Pparg	4
mmu00072	Synthesis and degradation of ketone bodies	2/355	11/8613	0.072870773	0.441455276	0.405367667	Hmgcs1/Hmgcs2	2
mmu04141	Protein processing in endoplasmic reticulum	11/355	163/8613	0.073505536	0.441455276	0.405367667	Dnaja1/Dnajb1/Dnajc10/Hsp90aa1/Hspa1b/Hspa4l/Hsph1/Os9/Sec24a/Syvn1/Ubqln4	11
mmu04977	Vitamin digestion and absorption	3/355	24/8613	0.074128301	0.441455276	0.405367667	Abcc1/Apob/Slc19a2	3
mmu05202	Transcriptional misregulation in cancer	12/355	183/8613	0.075241422	0.441455276	0.405367667	Cdkn2c/Fcgr1/Fut8/Gadd45b/Hpgd/Kdm6a/Maf/Pparg/Prom1/Tgfbr2/Tmprss2/Uty	12
mmu05218	Melanoma	6/355	72/8613	0.075614277	0.441455276	0.405367667	Ccnd1/Cdh1/Egfr/Fgf1/Gadd45b/Pdgfc	6
mmu04152	AMPK signaling pathway	9/355	126/8613	0.075649083	0.441455276	0.405367667	Adipor2/Camkk2/Ccnd1/Irs2/Lepr/Pck1/Pparg/Scd2/Srebf1	9
mmu05164	Influenza A	11/355	164/8613	0.076039691	0.441455276	0.405367667	Ccl5/Cxcl10/Dnajb1/H2-Eb1/Icam1/Il33/Irf7/Jak1/Socs3/Tmprss2/Tmprss4	11
mmu04974	Protein digestion and absorption	7/355	90/8613	0.077306248	0.441455276	0.405367667	Col27a1/Col5a2/Col5a3/Col6a3/Mme/Slc38a2/Slc3a1	7
mmu00280	Valine, leucine and isoleucine degradation	5/355	56/8613	0.079837656	0.441455276	0.405367667	Aldh1b1/Aox1/Aox3/Hmgcs1/Hmgcs2	5
mmu04923	Regulation of lipolysis in adipocytes	5/355	56/8613	0.079837656	0.441455276	0.405367667	Adora1/Fabp4/Gnai1/Irs2/Mgll	5
mmu04668	TNF signaling pathway	8/355	110/8613	0.083708729	0.444053304	0.407753314	Ccl5/Cflar/Cxcl1/Cxcl10/Icam1/Ifi47/Mlkl/Socs3	8
mmu00860	Porphyrin and chlorophyll metabolism	4/355	41/8613	0.087071089	0.444053304	0.407753314	Alas1/Alas2/Cpox/Gusb	4
mmu04216	Ferroptosis	4/355	41/8613	0.087071089	0.444053304	0.407753314	Acsl1/Prnp/Sat1/Slc11a2	4

mmu05219	Bladder cancer	4/355	41/8613	0.087071089	0.444053304	0.407753314	Ccnd1/Cdh1/Dapk1/Egfr	4
mmu05212	Pancreatic cancer	6/355	75/8613	0.088180798	0.444053304	0.407753314	Ccnd1/Egfr/Gadd45b/Jak1/Stat3/Tgfbr2	6
mmu05321	Inflammatory bowel disease (IBD)	5/355	59/8613	0.094933304	0.46967003	0.431275951	H2-Eb1/Maf/Rorc/Stat3/Tlr2	5
mmu05215	Prostate cancer	7/355	97/8613	0.104860771	0.509840299	0.468162424	Ar/Ccnd1/Egfr/Gstp1/Hsp90aa1/Pdgfc/Tmprss2	7
mmu04933	AGE-RAGE signaling pathway in diabetic complications	7/355	101/8613	0.122698751	0.568727861	0.52223611	Ccnd1/Icam1/Nox4/Pim1/Stat3/Tgfbr2/Vegfc	7
mmu04623	Cytosolic DNA-sensing pathway	5/355	64/8613	0.123046331	0.568727861	0.52223611	Ccl5/Cxcl10/Il33/Irf7/Zbp1	5
mmu05160	Hepatitis C	10/355	160/8613	0.124326261	0.568727861	0.52223611	Ccnd1/Cflar/Cxcl10/Egfr/Ifit1/Irf7/Jak1/Ocln/Socs3/Stat3	10
mmu00604	Glycosphingolipid biosynthe-sis-ganglio series	2/355	15/8613	0.125039459	0.568727861	0.52223611	Hexb/St3gal5	2
mmu04146	Peroxisome	6/355	84/8613	0.132172168	0.586832063	0.538860349	Abcd2/Acsl1/Agxt/Eci3/Hao2/Nudt7	6
mmu00980	Metabolism of xenobiotics by cytochrome P450	5/355	66/8613	0.13526271	0.586832063	0.538860349	Adh4/Cbr3/Gstm3/Gstp1/Gstt3	5
mmu05223	Non-small cell lung cancer	5/355	66/8613	0.13526271	0.586832063	0.538860349	Ccnd1/Egfr/Gadd45b/Rarb/Stat3	5
mmu05146	Amoebiasis	7/355	106/8613	0.147021928	0.588949834	0.540804999	C8a/C8b/C9/Il1r1/Lama3/Serpinb1a/Tlr2	7
mmu00983	Drug metabolism-other enzymes	6/355	87/8613	0.148797772	0.588949834	0.540804999	Gstm3/Gstp1/Gstt3/Gusb/Tpmt/Umps	6
mmu00330	Arginine and proline metabo-lism	4/355	50/8613	0.149746257	0.588949834	0.540804999	Aldh1b1/P4ha1/P4ha2/Sat1	4
mmu05224	Breast cancer	9/355	147/8613	0.152754123	0.588949834	0.540804999	Ccnd1/Egfr/Esr1/Fgf1/Gadd45b/Hes1/Lrp6/Shc1/Wnt5b	9
mmu00910	Nitrogen metabolism	2/355	17/8613	0.153637329	0.588949834	0.540804999	Car2/Car8	2
mmu05169	Epstein-Barr virus infection	13/355	230/8613	0.154457631	0.588949834	0.540804999	Ccnd1/Cxcl10/Entpd8/Gadd45b/H2-Eb1/Hes1/Icam1/Irf7/Jak1/Nfk-bie/Skp2/Stat3/Tlr2	13
mmu04610	Complement and coagulation cascades	6/355	88/8613	0.154540669	0.588949834	0.540804999	C6/C8a/C8b/C9/F2r/Pros1	6
mmu05416	Viral myocarditis	6/355	88/8613	0.154540669	0.588949834	0.540804999	Cav1/Ccnd1/Cxadr/Eif4g1/H2-Eb1/Icam1	6
mmu04927	Cortisol synthesis and secre-tion	5/355	69/8613	0.15454712	0.588949834	0.540804999	Cyp17a1/Hsd3b2/Hsd3b5/Nceh1/Pde8a	5
mmu05145	Toxoplasmosis	7/355	108/8613	0.157347875	0.591628011	0.543264243	Gnai1/H2-Eb1/Hspa1b/Jak1/Lama3/Stat3/Tlr2	7
mmu00040	Pentose and glucuronate interconversions	3/355	34/8613	0.163398841	0.6062957	0.556732894	Akr1b7/Gusb/Ugdh	3
mmu05225	Hepatocellular carcinoma	10/355	171/8613	0.168075495	0.615549214	0.565229961	Ccnd1/Egfr/Gadd45b/Gstm3/Gstp1/Gstt3/Lrp6/Shc1/Tgfbr2/Wnt5b	10
mmu04657	IL-17 signaling pathway	6/355	91/8613	0.172339748	0.623074474	0.572140054	Cxcl1/Cxcl10/Hsp90aa1/Lcn2/S100a8/S100a9	6
mmu00100	Steroid biosynthesis	2/355	19/8613	0.183330146	0.654419003	0.600922265	Hsd17b7/Msmo1	2
mmu05214	Glioma	5/355	75/8613	0.196200856	0.674147281	0.619037816	Camk2b/Ccnd1/Egfr/Gadd45b/Shc1	5
mmu04350	TGF-beta signaling pathway	6/355	95/8613	0.19730784	0.674147281	0.619037816	Bmp2/Fst/Hamp2/Inhbb/Rock1/Tgfbr2	6
mmu04640	Hematopoietic cell lineage	6/355	95/8613	0.19730784	0.674147281	0.619037816	Cd24a/Csf2ra/Fcgr1/H2-Eb1/Il1r1/Mme	6
mmu04510	Focal adhesion	11/355	199/8613	0.198419235	0.674147281	0.619037816	Cav1/Ccnd1/Col6a3/Egfr/Flna/Lama3/Pdgfc/Rock1/Shc1/Spp1/Vegfc	11
mmu04062	Chemokine signaling pathway	11/355	200/8613	0.202801669	0.680834176	0.625178078	Ccl5/Ccl6/Cxcl1/Cxcl10/Cxcl9/Gnai1/Hck/Rasgrp2/Rock1/Shc1/Stat3	11
mmu00620	Pyruvate metabolism	3/355	38/8613	0.205270425	0.681014823	0.625343958	Aldh1b1/Ldhd/Pck1	3

mmu00531	Glycosaminoglycan degradation	2/355	21/8613	0.21375607	0.700475006	0.643213331	Gusb/Hexb	2
mmu05213	Endometrial cancer	4/355	58/8613	0.216103991	0.700475006	0.643213331	Ccnd1/Cdh1/Egfr/Gadd45b	4
mmu04620	Toll-like receptor signaling pathway	6/355	99/8613	0.223528677	0.712656474	0.654399002	Ccl5/Cxcl10/Cxcl9/Irf7/Spp1/Tlr2	6
mmu00310	Lysine degradation	4/355	59/8613	0.224916405	0.712656474	0.654399002	Aldh1b1/Bbox1/Hykk/Setd7	4
mmu04964	Proximal tubule bicarbonate reclamation	2/355	22/8613	0.229144984	0.717987618	0.659294341	Car2/Pck1	2
mmu01521	EGFR tyrosine kinase inhibitor resistance	5/355	80/8613	0.233529327	0.721981722	0.662961939	Egfr/Jak1/Pdgfc/Shc1/Stat3	5
mmu05418	Fluid shear stress and atherosclerosis	8/355	143/8613	0.237040624	0.721981722	0.662961939	Cav1/Gpc1/Gstm3/Gstp1/Gstt3/Hsp90aa1/Icam1/Il1r1	8
mmu03440	Homologous recombination	3/355	41/8613	0.238100355	0.721981722	0.662961939	Rad51b/Rpa2/Rpa3	3
mmu04015	Rap1 signaling pathway	11/355	209/8613	0.244036719	0.726088465	0.666732969	Cdh1/Efna1/Egfr/F2r/Fgf1/Gnai1/Pdgfc/Prkd3/Rapgef4/Rasgrp2/Vegfc	11
mmu00900	Terpenoid backbone biosynthesis	2/355	23/8613	0.24460427	0.726088465	0.666732969	Hmgcs1/Hmgcs2	2
mmu04071	Sphingolipid signaling pathway	7/355	124/8613	0.250329487	0.730497121	0.670781231	Abcc1/Adora1/Cers6/Gnai1/Rock1/S1pr3/Sptlc2	7
mmu04530	Tight junction	9/355	167/8613	0.251270286	0.730497121	0.670781231	Ccnd1/Mpp4/Myh10/Myh9/Ocln/Rdx/Rock1/Synpo/Ybx3	9
mmu00340	Histidine metabolism	2/355	24/8613	0.260102086	0.741911004	0.681262064	Aldh1b1/Amdhd1	2
mmu03420	Nucleotide excision repair	3/355	43/8613	0.260458118	0.741911004	0.681262064	Rfc3/Rpa2/Rpa3	3
mmu05323	Rheumatoid arthritis	5/355	84/8613	0.264716383	0.745571984	0.68462377	Atp6v0d2/Ccl5/H2-Eb1/Icam1/Tlr2	5
mmu04380	Osteoclast differentiation	7/355	128/8613	0.275863889	0.745571984	0.68462377	Fcgr1/Fosl2/Il1r1/Jak1/Pparg/Socs3/Tgfbr2	7
mmu04928	Parathyroid hormone synthesis, secretion and action	6/355	107/8613	0.278980903	0.745571984	0.68462377	Egfr/Gnai1/Lrp6/Mafb/Pde4d/Slc34a2	6
mmu04810	Regulation of actin cytoskeleton	11/355	217/8613	0.283041776	0.745571984	0.68462377	Cyfip2/Egfr/F2r/Fgf1/Iqgap1/Myh10/Myh9/Nckap1l/Pdgfc/Rdx/Rock1	11
mmu04978	Mineral absorption	3/355	45/8613	0.283072177	0.745571984	0.68462377	Slc11a2/Slc34a2/Steap2	3
mmu04140	Autophagy-animal	7/355	130/8613	0.288878101	0.745571984	0.68462377	Atg16l2/Camkk2/Cflar/Dapk1/Irs2/Rb1cc1/Trp53inp2	7
mmu04392	Hippo signaling pathway-multiple species	2/355	26/8613	0.291098243	0.745571984	0.68462377	Rassf4/Wwtr1	2
mmu05235	PD-L1 expression and PD-1 checkpoint pathway in cancer	5/355	88/8613	0.296776307	0.745571984	0.68462377	Egfr/Jak1/Nfkbie/Stat3/Tlr2	5
mmu05140	Leishmaniasis	4/355	67/8613	0.298105522	0.745571984	0.68462377	Fcgr1/H2-Eb1/Jak1/Tlr2	4
mmu04931	Insulin resistance	6/355	110/8613	0.300560937	0.745571984	0.68462377	Irs2/Pck1/Ppargc1b/Socs3/Srebf1/Stat3	6
mmu04390	Hippo signaling pathway	8/355	154/8613	0.30211761	0.745571984	0.68462377	Afp/Bmp2/Ccnd1/Cdh1/Fgf1/Tgfbr2/Wnt5b/Wwtr1	8
mmu00053	Ascorbate and aldarate metabolism	2/355	27/8613	0.306544765	0.745571984	0.68462377	Aldh1b1/Ugdh	2
mmu00650	Butanoate metabolism	2/355	27/8613	0.306544765	0.745571984	0.68462377	Hmgcs1/Hmgcs2	2
mmu04950	Maturity onset diabetes of the young	2/355	27/8613	0.306544765	0.745571984	0.68462377	Hes1/Onecut1	2
mmu04966	Collecting duct acid secretion	2/355	27/8613	0.306544765	0.745571984	0.68462377	Atp6v0d2/Car2	2

mmu04217	Necroptosis	9/355	177/8613	0.307030185	0.745571984	0.68462377	Camk2b/Cflar/Hsp90aa1/Il33/Jak1/Mlkl/Spata2l/Stat3/Zbp1	9
mmu04211	Longevity regulating pathway	5/355	90/8613	0.313046944	0.745571984	0.68462377	Adipor2/Camkk2/Irs2/Pparg/Rb1cc1	5
mmu05221	Acute myeloid leukemia	4/355	69/8613	0.316899092	0.745571984	0.68462377	Ccnd1/Fcgr1/Pim1/Stat3	4
mmu00380	Tryptophan metabolism	3/355	48/8613	0.317264674	0.745571984	0.68462377	Aldh1b1/Aox1/Aox3	3
mmu00600	Sphingolipid metabolism	3/355	48/8613	0.317264674	0.745571984	0.68462377	Arsa/Cers6/Sptlc2	3
mmu04930	Type II diabetes mellitus	3/355	48/8613	0.317264674	0.745571984	0.68462377	Irs2/Socs2/Socs3	3
mmu05032	Morphine addiction	5/355	92/8613	0.32943294	0.761476139	0.69922781	Adora1/Gabrb3/Gnai1/Pde4d/Pde8a	5
mmu05222	Small cell lung cancer	5/355	92/8613	0.32943294	0.761476139	0.69922781	Ccnd1/Gadd45b/Lama3/Rarb/Skp2	5
mmu04550	Signaling pathways regulating pluripotency of stem cells	7/355	137/8613	0.335414094	0.767901692	0.705128094	Il6st/Inhbb/Jak1/Lifr/Onecut1/Stat3/Wnt5b	7
mmu01522	Endocrine resistance	5/355	93/8613	0.3376589	0.767901692	0.705128094	Ccnd1/Cdkn2c/Egfr/Esr1/Shc1	5
mmu04520	Adherens junction	4/355	72/8613	0.345251355	0.778887056	0.715215438	Cdh1/Egfr/Iqgap1/Tgfbr2	4
mmu03460	Fanconi anemia pathway	3/355	51/8613	0.351520736	0.782517985	0.718549549	Hes1/Rpa2/Rpa3	3
mmu01523	Antifolate resistance	2/355	30/8613	0.352410582	0.782517985	0.718549549	Abcc1/Abcg2	2
mmu05100	Bacterial invasion of epithelial cells	4/355	74/8613	0.364191024	0.80235835	0.736768026	Cav1/Cdh1/Dnm2/Shc1	4
mmu00630	Glyoxylate and dicarboxylate metabolism	2/355	31/8613	0.36747785	0.803323672	0.737654435	Agxt/Hao2	2
mmu04024	cAMP signaling pathway	10/355	211/8613	0.371257598	0.803451973	0.737772248	Adora1/Atp2a2/Atp2b2/Camk2b/F2r/Gnai1/Pde4d/Rapgef4/Rock1/Sox9	10
mmu05206	MicroRNAs in cancer	13/355	281/8613	0.374410454	0.803451973	0.737772248	Abcb1a/Abcc1/Ccnd1/Ccng1/Dnmt1/Egfr/Irs2/Pim1/Rdx/Rock1/Shc1/Stat3/Stmn1	13
mmu05322	Systemic lupus erythematosus	7/355	143/8613	0.376083902	0.803451973	0.737772248	C6/C8a/C8b/C9/Fcgr1/H2-Eb1/Hist2h2be	7
mmu00030	Pentose phosphate pathway	2/355	32/8613	0.382406946	0.806243362	0.74033545	G6pdx/Pgd	2
mmu05220	Chronic myeloid leukemia	4/355	76/8613	0.383108548	0.806243362	0.74033545	Ccnd1/Gadd45b/Shc1/Tgfbr2	4
mmu05231	Choline metabolism in cancer	5/355	99/8613	0.387227189	0.808874573	0.742751568	Chpt1/Egfr/Pdgfc/Slc22a5/Slc44a2	5
mmu00500	Starch and sucrose metabolism	2/355	33/8613	0.39718367	0.823572022	0.756247545	Enpp1/Enpp3	2
mmu04151	PI3K-Akt signaling pathway	16/355	358/8613	0.405691268	0.835072538	0.76680793	Ccnd1/Col6a3/Efna1/Egfr/F2r/Fgf1/Hsp90aa1/Jak1/Lama3/Osmr/Pck1/Pdgfc/Prlr/Spp1/Tlr2/Vegfc	16
mmu04925	Aldosterone synthesis and secretion	5/355	102/8613	0.4119796	0.841871356	0.773050966	Atp2b2/Camk2b/Hsd3b2/Hsd3b5/Prkd3	5
mmu05142	Chagas disease (American trypanosomiasis)	5/355	103/8613	0.420202176	0.852496501	0.782807538	Ccl5/Cflar/Gnai1/Tgfbr2/Tlr2	5
mmu00051	Fructose and mannose metabolism	2/355	35/8613	0.426230108	0.858549217	0.788365463	Akr1b7/Gmds	2
mmu05134	Legionellosis	3/355	58/8613	0.430280692	0.860561383	0.79021314	Cxcl1/Hspa1b/Tlr2	3
mmu04972	Pancreatic secretion	5/355	105/8613	0.436585304	0.863574477	0.792979923	Atp2a2/Atp2b2/Car2/Clca3a1/Rab3d	5
mmu04010	MAPK signaling pathway	13/355	294/8613	0.43791188	0.863574477	0.792979923	Efna1/Egfr/Fgf1/Flna/Gadd45b/Hspa1b/Il1r1/Pdgfc/Rasa2/Rasgrp2/Stmn1/Tgfbr2/Vegfc	13
mmu00533	Glycosaminoglycan biosynthesis-keratan sulfate	1/355	14/8613	0.445516568	0.872469945	0.801148214	Fut8	1
mmu05152	Tuberculosis	8/355	178/8613	0.452806996	0.880631538	0.808642622	Atp6v0d2/Camk2b/Clec7a/Coro1a/Fcgr1/H2-Eb1/Jak1/Tlr2	8
mmu01212	Fatty acid metabolism	3/355	61/8613	0.463032147	0.894349763	0.821239424	Acsl1/Elovl3/Scd2	3

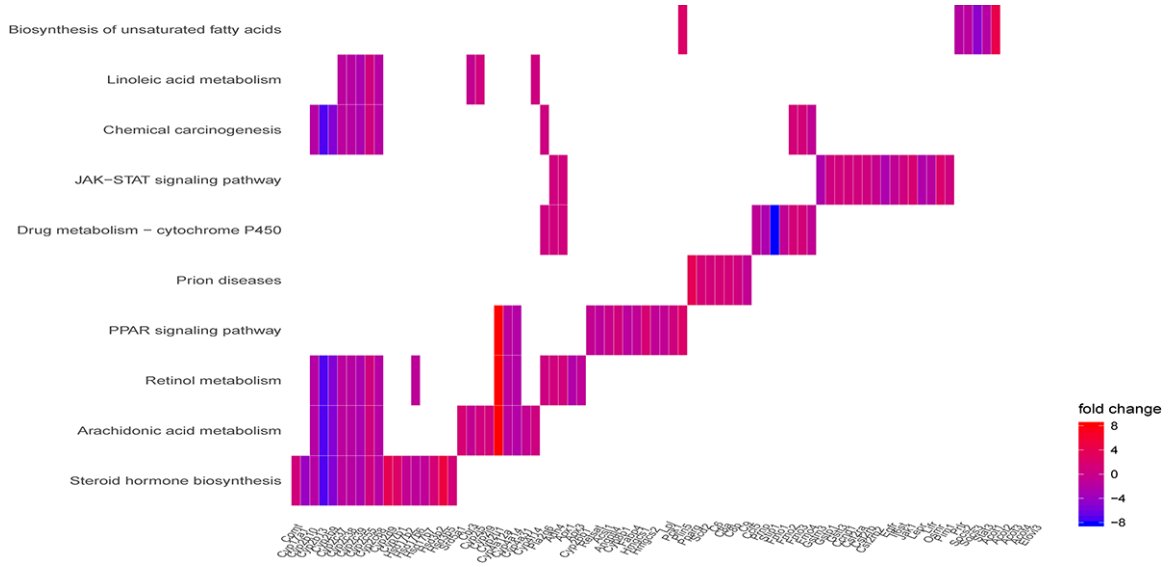
mmu00250	Alanine, aspartate and glutamate metabolism	2/355	38/8613	0.46837769	0.898520466	0.825069185	Agxt/Asns	2
mmu04915	Estrogen signaling pathway	6/355	134/8613	0.477565361	0.899804332	0.826248099	Egfr/Esr1/Gnai1/Hsp90aa1/Hspa1b/Shc1	6
mmu05203	Viral carcinogenesis	10/355	231/8613	0.483196272	0.899804332	0.826248099	Atp6v0d2/Ccnd1/Egr2/Hist2h2be/Il6st/Irf7/Jak1/Rasa2/Skp2/Stat3	10
mmu05217	Basal cell carcinoma	3/355	63/8613	0.484407251	0.899804332	0.826248099	Bmp2/Gadd45b/Wnt5b	3
mmu04658	Th1 and Th2 cell differentiation	4/355	87/8613	0.485000917	0.899804332	0.826248099	H2-Eb1/Jak1/Maf/Nfkbie	4
mmu04666	Fc gamma R-mediated phagocytosis	4/355	87/8613	0.485000917	0.899804332	0.826248099	Dnm2/Fcgr1/Hck/Pla2g6	4
mmu00603	Glycosphingolipid biosynthesis-globo and isoglobo series	1/355	16/8613	0.490356526	0.901369223	0.827685065	Hexb	1
mmu05210	Colorectal cancer	4/355	88/8613	0.493963993	0.901369223	0.827685065	Ccnd1/Egfr/Gadd45b/Tgfbr2	4
mmu04975	Fat digestion and absorption	2/355	40/8613	0.495433438	0.901369223	0.827685065	Apob/Dgat2	2
mmu00450	Selenocompound metabolism	1/355	17/8613	0.511401476	0.917344567	0.842354473	Papss2	1
mmu04670	Leukocyte transendothelial migration	5/355	115/8613	0.516499675	0.917344567	0.842354473	Gnai1/Icam1/Ocln/Rapgef4/Rock1	5
mmu04612	Antigen processing and presentation	4/355	91/8613	0.520446818	0.917344567	0.842354473	H2-Eb1/Hsp90aa1/Hspa1b/Ifi30	4
mmu04270	Vascular smooth muscle contraction	6/355	140/8613	0.520479187	0.917344567	0.842354473	Cyp4a12a/Cyp4a14/Cyp4a31/Pla2g6/Ppp1r14a/Rock1	6
mmu04910	Insulin signaling pathway	6/355	140/8613	0.520479187	0.917344567	0.842354473	Irs2/Pck1/Shc1/Socs2/Socs3/Srebf1	6
mmu00010	Glycolysis / Gluconeogenesis	3/355	67/8613	0.525882196	0.92111043	0.845812489	Adh4/Aldh1b1/Pck1	3
mmu00511	Other glycan degradation	1/355	18/8613	0.531579754	0.92159312	0.84625572	Hexb	1
mmu04962	Vasopressin-regulated water reabsorption	2/355	43/8613	0.534338063	0.92159312	0.84625572	Aqp4/Dynll1	2
mmu04622	RIG-I-like receptor signaling pathway	3/355	68/8613	0.535961956	0.92159312	0.84625572	Cxcl10/Dhx58/Irf7	3
mmu05167	Kaposi sarcoma-associated herpesvirus infection	9/355	217/8613	0.541153853	0.924770244	0.849173125	Ccnd1/Clec2h/Cxcl1/Hck/Icam1/Il6st/Irf7/Jak1/Stat3	9
mmu05162	Measles	6/355	144/8613	0.548311275	0.924770244	0.849173125	Ccnd1/Hspa1b/Irf7/Jak1/Stat3/Tlr2	6
mmu00061	Fatty acid biosynthesis	1/355	19/8613	0.550926954	0.924770244	0.849173125	Acsl1	1
mmu00220	Arginine biosynthesis	1/355	19/8613	0.550926954	0.924770244	0.849173125	Otc	1
mmu05150	Staphylococcus aureus infection	4/355	96/8613	0.563064906	0.937991441	0.86131353	Defb1/Fcgr1/H2-Eb1/Icam1	4
mmu04115	p53 signaling pathway	3/355	71/8613	0.565455834	0.937991441	0.86131353	Ccnd1/Ccng1/Gadd45b	3
mmu00564	Glycerophospholipid metabolism	4/355	97/8613	0.571339116	0.939461201	0.862663141	Chpt1/Lpin1/Pla2g15/Pla2g6	4
mmu04261	Adrenergic signaling in cardiomyocytes	6/355	148/8613	0.57540343	0.939461201	0.862663141	Atp2a2/Atp2b2/Camk2b/Crem/Gnai1/Rapgef4	6
mmu04072	Phospholipase D signaling pathway	6/355	149/8613	0.5820506	0.939461201	0.862663141	Dnm2/Egfr/F2r/Pdgfc/Rapgef4/Shc1	6
mmu00565	Ether lipid metabolism	2/355	47/8613	0.582932353	0.939461201	0.862663141	Chpt1/Pla2g6	2
mmu04971	Gastric acid secretion	3/355	74/8613	0.59377938	0.939461201	0.862663141	Camk2b/Car2/Gnai1	3

mmu04932	Non-alcoholic fatty liver disease (NAFLD)	6/355	151/8613	0.595185418	0.939461201	0.862663141	Adipor2/Irs2/Lepr/Ndufab1/Socs3/Srebf1	6
mmu04330	Notch signaling pathway	2/355	49/8613	0.605793466	0.939461201	0.862663141	Dtx3l/Hes1	2
mmu05144	Malaria	2/355	49/8613	0.605793466	0.939461201	0.862663141	Icam1/Tlr2	2
mmu04924	Renin secretion	3/355	76/8613	0.611985849	0.939461201	0.862663141	Adora1/Clca3a1/Gnai1	3
mmu04921	Oxytocin signaling pathway	6/355	154/8613	0.61447274	0.939461201	0.862663141	Camk2b/Camkk2/Ccnd1/Egfr/Gnai1/Rock1	6
mmu00510	N-Glycan biosynthesis	2/355	50/8613	0.616863529	0.939461201	0.862663141	Fut8/Mgat5	2
mmu04360	Axon guidance	7/355	180/8613	0.61690902	0.939461201	0.862663141	Ablim3/Camk2b/Efna1/Gnai1/Robo1/Rock1/Wnt5b	7
mmu04621	NOD-like receptor signaling pathway	8/355	206/8613	0.619595368	0.939461201	0.862663141	Casp4/Ccl5/Cxcl1/Hsp90aa1/Irf7/Jak1/Nod1/Txnip	8
mmu01524	Platinum drug resistance	3/355	77/8613	0.620882072	0.939461201	0.862663141	Gstm3/Gstp1/Gstt3	3
mmu04721	Synaptic vesicle cycle	3/355	77/8613	0.620882072	0.939461201	0.862663141	Atp6v0d2/Dnm2/Stx3	3
mmu04145	Phagosome	7/355	181/8613	0.622754313	0.939461201	0.862663141	Atp6v0d2/Clec7a/Coro1a/Fcgr1/H2-Eb1/Msr1/Tlr2	7
mmu04014	Ras signaling pathway	9/355	233/8613	0.627570151	0.939461201	0.862663141	Efna1/Egfr/Fgf1/Pdgfc/Pla2g6/Rasa2/Rasgrp2/Shc1/Vegfc	9
mmu01230	Biosynthesis of amino acids	3/355	78/8613	0.62963889	0.939461201	0.862663141	Asns/Cbs/Otc	3
mmu05132	Salmonella infection	3/355	78/8613	0.62963889	0.939461201	0.862663141	Cxcl1/Flna/Rock1	3
mmu04926	Relaxin signaling pathway	5/355	131/8613	0.633014621	0.939526965	0.862723528	Egfr/Gnai1/Shc1/Tgfbr2/Vegfc	5
mmu00270	Cysteine and methionine metabolism	2/355	52/8613	0.638285321	0.942389846	0.865352378	Cbs/Dnmt1	2
mmu00592	alpha-Linolenic acid metabolism	1/355	25/8613	0.651374432	0.951749171	0.873946607	Pla2g6	1
mmu05310	Asthma	1/355	25/8613	0.651374432	0.951749171	0.873946607	H2-Eb1	1
mmu04064	NF-kappa B signaling pathway	4/355	109/8613	0.663368126	0.952998808	0.87509409	Cflar/Gadd45b/Icam1/Il1r1	4
mmu04210	Apoptosis	5/355	136/8613	0.665716798	0.952998808	0.87509409	Cflar/Csf2rb/Csf2rb2/Ctso/Gadd45b	5
mmu00790	Folate biosynthesis	1/355	26/8613	0.66578548	0.952998808	0.87509409	Akr1b7	1
mmu04961	Endocrine and other factor-regulated calcium reabsorption	2/355	55/8613	0.668640502	0.952998808	0.87509409	Dnm2/Esr1	2
mmu05161	Hepatitis B	6/355	163/8613	0.669126823	0.952998808	0.87509409	Egr2/Irf7/Jak1/Stat3/Tgfbr2/Tlr2	6
mmu04012	ErbB signaling pathway	3/355	84/8613	0.679219601	0.958239427	0.879906305	Camk2b/Egfr/Shc1	3
mmu00601	Glycosphingolipid biosynthesis-lacto and neolacto series	1/355	27/8613	0.679602431	0.958239427	0.879906305	St3gal6	1
mmu04120	Ubiquitin mediated proteolysis	5/355	139/8613	0.684405377	0.960202654	0.881709044	Klhl13/Skp2/Socs3/Syvn1/Ube2b	5
mmu05166	Human T-cell leukemia virus 1 infection	9/355	246/8613	0.690971327	0.960202654	0.881709044	Ccnd1/Cdkn2c/Egr2/H2-Eb1/Icam1/Il1r1/Jak1/Pttg1/Tgfbr2	9
mmu04512	ECM-receptor interaction	3/355	86/8613	0.694614686	0.960202654	0.881709044	Col6a3/Lama3/Spp1	3
mmu04540	Gap junction	3/355	86/8613	0.694614686	0.960202654	0.881709044	Egfr/Gnai1/Pdgfc	3
mmu04919	Thyroid hormone signaling pathway	4/355	115/8613	0.704032292	0.966889761	0.887849501	Atp2a2/Ccnd1/Esr1/Rcan2	4
mmu04114	Oocyte meiosis	4/355	116/8613	0.710453249	0.966889761	0.887849501	Ar/Camk2b/Pttg1/Smc1a	4
mmu04710	Circadian rhythm	1/355	30/8613	0.717727988	0.966889761	0.887849501	Rorc	1
mmu04022	cGMP-PKG signaling pathway	6/355	172/8613	0.718632474	0.966889761	0.887849501	Adora1/Atp2a2/Atp2b2/Gnai1/Irs2/Rock1	6
mmu04727	GABAergic synapse	3/355	90/8613	0.723721078	0.966889761	0.887849501	Gabrb3/Gnai1/Slc38a2	3

mmu04914	Progesterone-mediated oocyte maturation	3/355	90/8613	0.723721078	0.966889761	0.887849501	Gnai1/Hsp90aa1/Stk10	3
mmu04213	Longevity regulating pathway-multiple species	2/355	62/8613	0.731465314	0.966889761	0.887849501	Hspa1b/Irs2	2
mmu01200	Carbon metabolism	4/355	120/8613	0.735120982	0.966889761	0.887849501	Agxt/G6pdx/Hao2/Pgd	4
mmu00020	Citrate cycle (TCA cycle)	1/355	32/8613	0.740596413	0.966889761	0.887849501	Pck1	1
mmu00052	Galactose metabolism	1/355	32/8613	0.740596413	0.966889761	0.887849501	Akr1b7	1
mmu00410	beta-Alanine metabolism	1/355	32/8613	0.740596413	0.966889761	0.887849501	Aldh1b1	1
mmu04215	Apoptosis-multiple species	1/355	32/8613	0.740596413	0.966889761	0.887849501	Bok	1
mmu05230	Central carbon metabolism in cancer	2/355	64/8613	0.747456666	0.971349216	0.891944409	Egfr/G6pdx	2
mmu04130	SNARE interactions in vesicular transport	1/355	33/8613	0.751328061	0.971901437	0.892451488	Stx3	1
mmu04611	Platelet activation	4/355	125/8613	0.763694316	0.983387201	0.902998326	F2r/Gnai1/Rasgrp2/Rock1	4
mmu04150	mTOR signaling pathway	5/355	155/8613	0.771963043	0.989516265	0.908626357	Clip1/Lpin1/Lrp6/Skp2/Wnt5b	5
mmu04614	Renin-angiotensin system	1/355	36/8613	0.780938488	0.992407315	0.911281073	Mme	1
mmu04713	Circadian entrainment	3/355	99/8613	0.781256823	0.992407315	0.911281073	Camk2b/Gnai1/Mtnr1a	3
mmu04916	Melanogenesis	3/355	100/8613	0.786997926	0.995217108	0.913861175	Camk2b/Gnai1/Wnt5b	3
mmu04310	Wnt signaling pathway	5/355	161/8613	0.799601393	0.999571428	0.917859542	Camk2b/Ccnd1/Lrp6/Notum/Wnt5b	5
mmu05412	Arrhythmogenic right ventricular cardiomyopathy (ARVC)	2/355	72/8613	0.803478769	0.999571428	0.917859542	Atp2a2/Dsg2	2
mmu05143	African trypanosomiasis	1/355	39/8613	0.807031817	0.999571428	0.917859542	Icam1	1
mmu00562	Inositol phosphate metabolism	2/355	73/8613	0.809647981	0.999571428	0.917859542	Isyna1/Pi4kb	2
mmu04066	HIF-1 signaling pathway	3/355	105/8613	0.813859732	0.999571428	0.917859542	Camk2b/Egfr/Stat3	3
mmu05033	Nicotine addiction	1/355	40/8613	0.815021519	0.999571428	0.917859542	Gabrb3	1
mmu05133	Pertussis	2/355	76/8613	0.827133315	0.999571428	0.917859542	Gnai1/Nod1	2
mmu04371	Apelin signaling pathway	4/355	139/8613	0.83098241	0.999571428	0.917859542	Ccnd1/Cdh1/Gnai1/Spp1	4
mmu05163	Human cytomegalovirus infection	8/355	256/8613	0.835034112	0.999571428	0.917859542	Ccl5/Ccnd1/Egfr/Gnai1/Il1r1/Jak1/Rock1/Stat3	8
mmu04672	Intestinal immune network for IgA production	1/355	43/8613	0.837064926	0.999571428	0.917859542	H2-Eb1	1
mmu03022	Basal transcription factors	1/355	44/8613	0.843814278	0.999571428	0.917859542	Taf7	1
mmu04340	Hedgehog signaling pathway	1/355	44/8613	0.843814278	0.999571428	0.917859542	Ccnd1	1
mmu04625	C-type lectin receptor signaling pathway	3/355	112/8613	0.846611776	0.999571428	0.917859542	Clec4n/Clec7a/Egr2	3
mmu05010	Alzheimer disease	5/355	175/8613	0.853836794	0.999571428	0.917859542	Atp2a2/Lpl/Mme/Ndufab1/Rtn4	5
mmu04724	Glutamatergic synapse	3/355	114/8613	0.855003461	0.999571428	0.917859542	Gnai1/Homer2/Slc38a2	3
mmu03050	Proteasome	1/355	46/8613	0.856487989	0.999571428	0.917859542	Psmb8	1
mmu03018	RNA degradation	2/355	83/8613	0.862440311	0.999571428	0.917859542	Ddx6/Tob2	2
mmu05030	Cocaine addiction	1/355	48/8613	0.868135952	0.999571428	0.917859542	Gnai1	1
mmu04723	Retrograde endocannabinoid signaling	4/355	150/8613	0.871978784	0.999571428	0.917859542	Gabrb3/Gnai1/Mgll/Ndufab1	4

mmu04144	Endocytosis	8/355	270/8613	0.874194007	0.999571428	0.917859542	Cav1/Dnm2/Egfr/Ehd3/Hspa1b/Igf2r/Spg20/Tgfbr2	8
mmu04911	Insulin secretion	2/355	86/8613	0.875450037	0.999571428	0.917859542	Camk2b/Rapgef4	2
mmu04722	Neurotrophin signaling pathway	3/355	121/8613	0.881296983	0.999571428	0.917859542	Camk2b/Nfkbie/Shc1	3
mmu05165	Human papillomavirus infection	11/355	361/8613	0.885857663	0.999571428	0.917859542	Atp6v0d2/Ccnd1/Col6a3/Egfr/Hes1/Jak1/Lama3/Oasl1/Oasl2/Spp1/Wnt5b	11
mmu04912	GnRH signaling pathway	2/355	90/8613	0.891037571	0.999571428	0.917859542	Camk2b/Egfr	2
mmu04020	Calcium signaling pathway	5/355	189/8613	0.895304416	0.999571428	0.917859542	Atp2a2/Atp2b2/Camk2b/Egfr/F2r	5
mmu03015	mRNA surveillance pathway	2/355	96/8613	0.911058031	0.999571428	0.917859542	Clp1/Pcf11	2
mmu05034	Alcoholism	5/355	199/8613	0.918330778	0.999571428	0.917859542	Camkk2/Gnai1/Hist2h2be/Shc1/Slc29a1	5
mmu03013	RNA transport	4/355	167/8613	0.918472912	0.999571428	0.917859542	Cyfip2/Eif2s3y/Eif3a/Eif4g1	4
mmu00190	Oxidative phosphorylation	3/355	134/8613	0.919111837	0.999571428	0.917859542	Atp6v0d2/Lhpp/Ndufab1	3
mmu04728	Dopaminergic synapse	3/355	135/8613	0.921510138	0.999571428	0.917859542	Camk2b/Comt/Gnai1	3
mmu04730	Long-term depression	1/355	61/8613	0.92397429	0.999571428	0.917859542	Gnai1	1
mmu04514	Cell adhesion molecules (CAMs)	4/355	171/8613	0.926942254	0.999571428	0.917859542	Cdh1/H2-Eb1/Icam1/Ocln	4
mmu04922	Glucagon signaling pathway	2/355	102/8613	0.9275968	0.999571428	0.917859542	Camk2b/Pck1	2
mmu05330	Allograft rejection	1/355	64/8613	0.93305539	0.999571428	0.917859542	H2-Eb1	1
mmu05332	Graft-versus-host disease	1/355	65/8613	0.935835287	0.999571428	0.917859542	H2-Eb1	1
mmu00970	Aminoacyl-tRNA biosynthesis	1/355	66/8613	0.938500059	0.999571428	0.917859542	Lars2	1
mmu04720	Long-term potentiation	1/355	67/8613	0.941054461	0.999571428	0.917859542	Camk2b	1
mmu04664	Fc epsilon RI signaling pathway	1/355	68/8613	0.943503053	0.999571428	0.917859542	Alox5ap	1
mmu05031	Amphetamine addiction	1/355	68/8613	0.943503053	0.999571428	0.917859542	Camk2b	1
mmu04940	Type I diabetes mellitus	1/355	70/8613	0.948100109	0.999571428	0.917859542	H2-Eb1	1
mmu04725	Cholinergic synapse	2/355	113/8613	0.950657551	0.999571428	0.917859542	Camk2b/Gnai1	2
mmu04662	B cell receptor signaling pathway	1/355	72/8613	0.952324079	0.999571428	0.917859542	Nfkbie	1
mmu04650	Natural killer cell mediated cytotoxicity	2/355	118/8613	0.958650643	0.999571428	0.917859542	Icam1/Shc1	2
mmu04260	Cardiac muscle contraction	1/355	78/8613	0.963047476	0.999571428	0.917859542	Atp2a2	1
mmu04970	Salivary secretion	1/355	78/8613	0.963047476	0.999571428	0.917859542	Atp2b2	1
mmu05320	Autoimmune thyroid disease	1/355	79/8613	0.964584458	0.999571428	0.917859542	H2-Eb1	1
mmu05410	Hypertrophic cardiomyopathy (HCM)	1/355	86/8613	0.973698503	0.999571428	0.917859542	Atp2a2	1
mmu03040	Spliceosome	2/355	133/8613	0.975858822	0.999571428	0.917859542	Hspa1b/Tra2a	2
mmu05414	Dilated cardiomyopathy (DCM)	1/355	90/8613	0.977813154	0.999571428	0.917859542	Atp2a2	1
mmu05012	Parkinson disease	2/355	144/8613	0.983839393	0.999571428	0.917859542	Gnai1/Ndufab1	2
mmu04070	Phosphatidylinositol signaling system	1/355	98/8613	0.984215914	0.999571428	0.917859542	Pi4kb	1
mmu04218	Cellular senescence	3/355	186/8613	0.984547175	0.999571428	0.917859542	Ccnd1/Gadd45b/Tgfbr2	3
mmu04660	T cell receptor signaling pathway	1/355	101/8613	0.986109134	0.999571428	0.917859542	Nfkbie	1

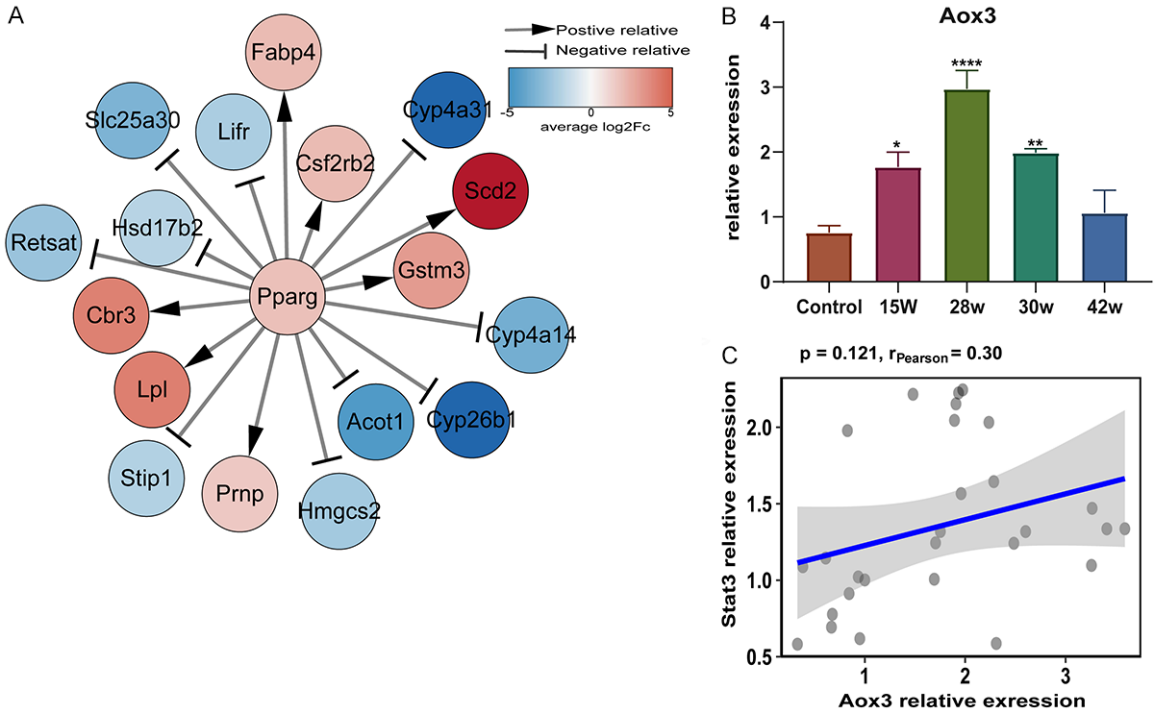
mmu04714	Thermogenesis	4/355	232/8613	0.987989446	0.999571428	0.917859542	Acsl1/Mgll/Ndufab1/Pparg	4
mmu04080	Neuroactive ligand-receptor interaction	7/355	348/8613	0.990771906	0.999571428	0.917859542	Adora1/F2r/Gabrb3/Lepr/Mtnr1a/Prlr/S1pr3	7
mmu05016	Huntington disease	2/355	194/8613	0.997533555	0.999571428	0.917859542	Ndufab1/Pparg	2
mmu05168	Herpes simplex virus 1 infection	7/355	439/8613	0.99934973	0.999571428	0.917859542	Ccl5/H2-Eb1/Irf7/Jak1/Socs3/Tlr2/Zfp810	7
mmu03010	Ribosome	1/355	175/8613	0.999414387	0.999571428	0.917859542	Rps25	1
mmu05170	Human immunodeficiency virus 1 infection	2/355	239/8613	0.999571428	0.999571428	0.917859542	Gnai1/Tlr2	2



Supplementary Figure 2. DEGs in 10 significant enriched KEGG signal pathway. Heatmap displayed all DEGs from 10 significant enriched KEGG signal pathways. Filled color in square represents average $\log_2$ fold change.

Supplementary Table 5. The genes significantly correlated with Stat3 in 10 KEGG signal pathways

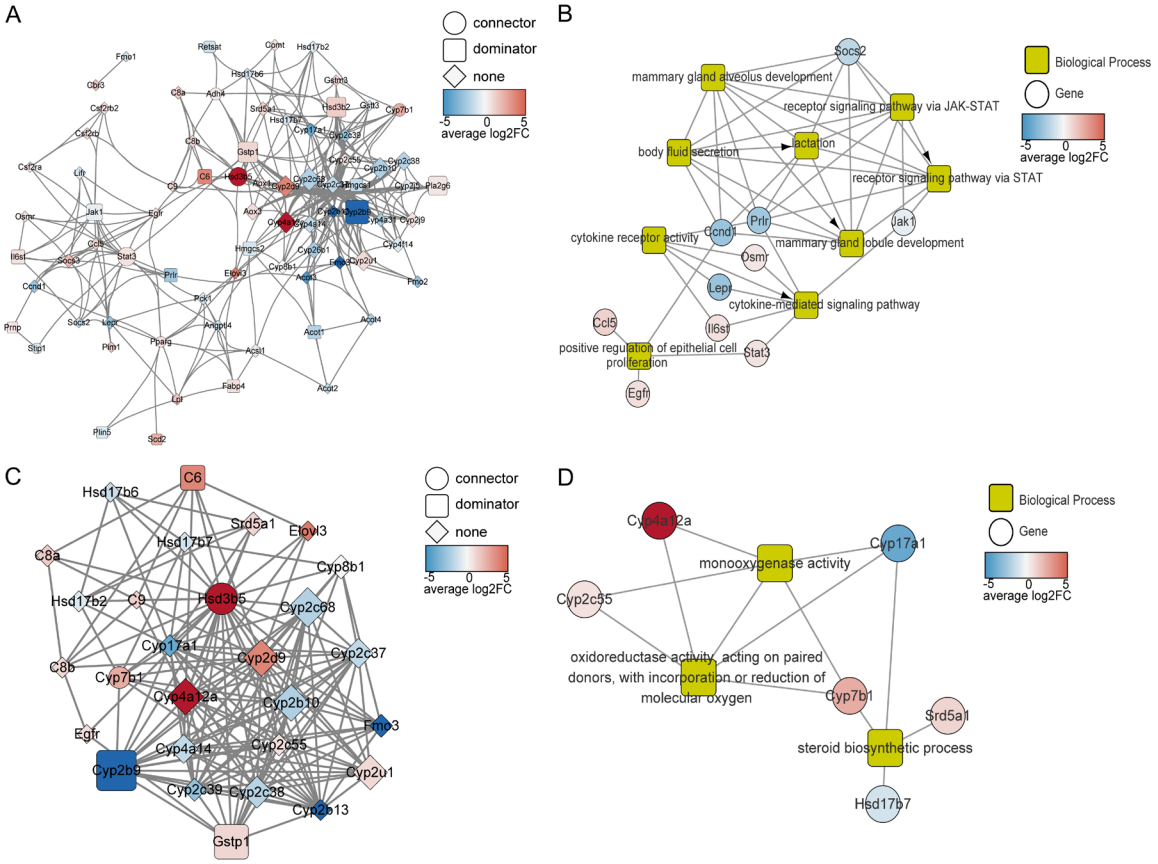
node1	node2	cor	p
Comt	Stat3	0.664137853	6.29E-05
Cyp2c68	Stat3	-0.484563936	0.006655111
Hsd17b6	Stat3	-0.448103483	0.013015829
Cyp4a14	Stat3	-0.4807323	0.007165377
Cyp4a31	Stat3	-0.470945579	0.008621435
Retsat	Stat3	-0.480445607	0.007204855
Acsl1	Stat3	-0.407397581	0.025447851
Angptl4	Stat3	-0.415782538	0.022304811
Scd2	Stat3	0.53751061	0.002190098
C6	Stat3	0.411746854	0.023775207
C9	Stat3	0.59496392	0.000524795
Fmo1	Stat3	-0.43419464	0.016511566
Ccnd1	Stat3	-0.446555149	0.013371422
Csf2rb	Stat3	0.430456875	0.017573564
Il6st	Stat3	0.691760319	2.30E-05
Jak1	Stat3	-0.410777162	0.0241401
Osmr	Stat3	0.455673855	0.011388926
Pim1	Stat3	0.471691302	0.008502329
Socs3	Stat3	0.630346108	0.000188857
Acot1	Stat3	-0.533125309	0.002417794
Acot2	Stat3	-0.503158772	0.004594385
Acot3	Stat3	-0.492918841	0.00564854
Acot4	Stat3	-0.526459155	0.002803051



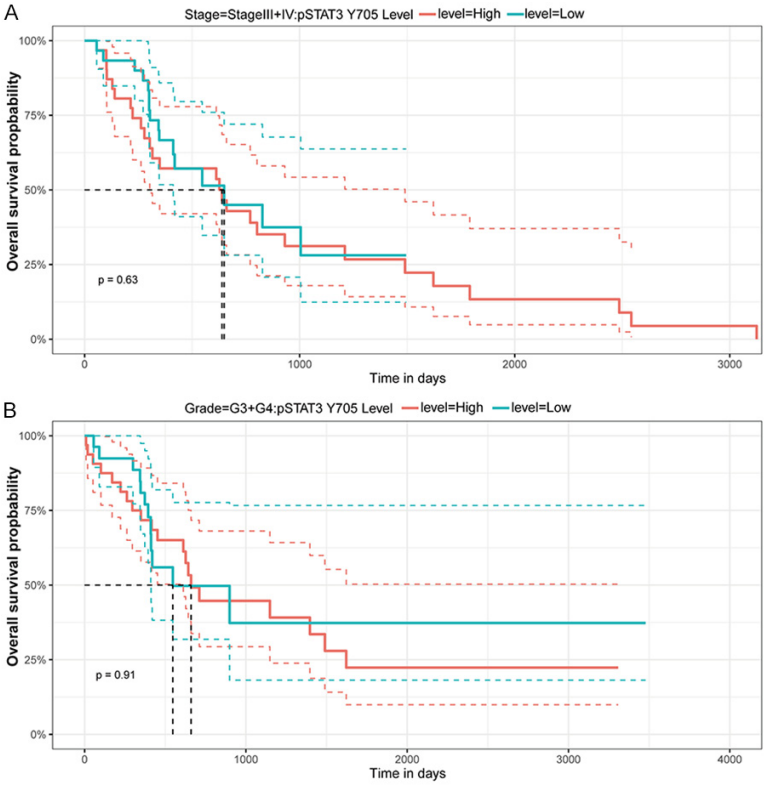
Supplementary Figure 3. Transcription factors expression relation. A. Network visualizes the gene and correlated with Pparg. Shape of the pointer represents positive or negative regulation. Size of the line represent expression relevance between two genes. B. Real-time PCR results of Aox3. Bars represent SEM and bold lines inside the box plot median levels. Blue line is trendline, and gray region represented confidence intervals of linear regression in the graphs. Multiple comparisons were corrected by the Tukey or Benjamini and Hochberg method. Levels of significance: *P<0.05; **P<0.005; ***P<0.0005; ****P<0.0001; C. Linear regression plots for Aox3 and Stat3.

Supplementary Table 6. The genes significantly correlated with Pparg in 10 KEGG signal pathways

node1	node2	cor	p
Hsd17b2	Pparg	-0.57284	0.000938
Fabp4	Pparg	0.420707	0.020613
Pparg	Slc25a30	-0.50529	0.004397
Scd2	Pparg	0.556188	0.001415
Prnp	Pparg	0.543551	0.001907
Stip1	Pparg	-0.47539	0.007931
Pparg	Cbr3	0.454335	0.011664
Pparg	Cyp4a14	-0.43425	0.016495
Pparg	Cyp4a31	-0.45927	0.010679
Pparg	Cyp26b1	-0.45346	0.011846
Pparg	Retsat	-0.43336	0.016744
Pparg	Hmgcs2	-0.54154	0.001998
Pparg	Lpl	0.412767	0.023396
Scd2	Pparg	0.556188	0.001415
Pparg	Gstm3	0.617671	0.000276
Pparg	Csf2rb2	0.530904	0.002541
Pparg	Lifr	-0.50731	0.004218
Pparg	Acot1	-0.44491	0.013759



Supplementary Figure 4. Protein to protein network analysis. A. The network diagram exhibited all nodes in the PPI network. Color in the nodes is according to average $\log_2$ fold change of each DEGs. The different role in PPI network is exhibited with different shape. B. The network diagram exhibits all proteins connected with Hsd3b5, and their role in PPI network. The color in the nodes represents the average $\log_2$ fold change of each DEG. The different roles in the PPI network are represented by different shapes. C. The network diagram display all biological process Hsd3b5-connected proteins were enriched in. The color in the gene nodes represents the average $\log_2$ fold change of each DEG. The different roles in the network are represented by different shapes. D. The network diagram display all biological process Stat3-connected proteins were enriched in. The color in the gene nodes represents the average $\log_2$ fold change of each DEG. The different roles in the network are represented by different shapes.



Supplementary Figure 5. Survival analysis for patients in Stage III+IV and G3+G4. A, B. Kaplan-Meier survival analysis demonstrated that there is no significant difference OS (overall survival) between patients with high expression and low expression in Stage III+IV and G3+G4.