

## LncRNA Microarray Analysis of Non-small Cell Lung Cancer A549 Cell Lines Treated with Phycocyanin

Shuai Hao\*, Boxiong Wu, Haozhe Cheng, Xinran Li, Wenjing Zhang and Qiancheng Li

Key Laboratory of Geriatric Nutrition and Health (Beijing Technology and Business University), Ministry of Education, Beijing Engineering and Technology Research Center of Food Additives, Beijing Technology and Business University, Beijing, 100048, China

### Abstract

Phycocyanin is a type of marine food additive with multiple biological properties, including anticancer activity, but its underlying antineoplastic mechanism in non-small cell lung cancer (NSCLC) remains unclear. To investigate the underlying regulatory mechanism of phycocyanin in NSCLC, an LncRNA microarray analysis was performed using a phycocyanin-treated A549 cell model. The classification and expression of LncRNA s were determined. The profiles of differentially expressed LncRNA s were generated and analyzed using Kyoto Encyclopedia of Genes and Genomes (KEGG) and Gene Ontology (GO) analyses. The results showed that 193 LncRNA s were upregulated and 116 LncRNA s were downregulated in the phycocyanin-treated group compared with the control group, and qRT-PCR analysis confirmed the expression of selected LncRNA s. Bioinformatic analysis indicated that the differentially expressed LncRNA s and their target genes were enriched in the extracellular region, epithelium development, NOD-like receptor pathway, Notch signaling, and apoptosis process. In addition, coexpression network analysis identified 2,238 LncRNA-mRNA, LncRNA-LncRNA, and mRNA-mRNA pairs. In particular, 72 etc. differentially expressed LncRNA target genes were discovered in the interaction network, which provides insights into the potential mechanism of phycocyanin in A549 cells. Moreover, cell phenotype experiments showed that downregulating the expression of LncRNA ENST00000538717, a LncRNA that is downregulated after phycocyanin treatment, could significantly inhibit the migration and viability of A549 and H460 cells. Consequently, this study lays a theoretical and potential foundation for NSCLC treatment and advances our understanding of the regulatory mechanisms of phycocyanin.

**Keywords:** A549 cells; Anticancer; LncRNA; Non-small cell lung cancer (NSCLC); Phycocyanin

### Introduction

Lung cancer remained the leading cause of cancer-related death in 2020, with an estimated 1.8 million deaths [1]. Non-small cell lung cancer (NSCLC), a subtype of lung cancer, accounts for approximately 85% of lung cancer cases and is characterized by high mortality and a low cure rate [2,3]. Currently, most NSCLCs are not effectively diagnosed at the early stage. Although treatments such as radiation therapy, chemotherapy or surgery have improved the survival rates of patients to a certain extent [4], the therapeutic efficacy of treatments for NSCLC is still very poor due to the lack of known biomarkers of NSCLC [4,5]. Therefore, in-depth research to identify specific biomarkers of NSCLC is urgently needed for the development of new drugs that effectively treat NSCLC.

Long noncoding RNAs (LncRNA s) are a class of regulatory RNA molecules that are larger than 200 nucleotides and have no protein-coding ability [6]. Unlike microRNAs and small nucleolar/nuclear RNAs, LncRNA s have complex higher order structures [7]. It has been shown that the ectopic expression of LncRNA s is relevant to the occurrence and metabolism of lung cancer. Luo et al. reported that LncRNA TRERNA1 could promote the malignant progression of NSCLC by targeting FOXL1 [8]. Zhao et al. found that LncRNA SNHG14 also contributed to the growth of NSCLC via the miR-206/G6PD pathway [9]. In addition, some other LncRNA s, such as FENDRR, could exert antineoplastic effects on NSCLC cells by regulating the miR-761/TIMP2 axis [10]. Therefore, in-depth exploration of the regulatory role of LncRNA s in NSCLC and their mechanism is of great importance for the future treatment of NSCLC.

Phycocyanin, a pigment-protein complex derived from cyanobacteria, is a well-known natural food additive [11]. It has been revealed that phycocyanin, which is a potential natural antineoplastic

factor, exerts antitumor effects on NSCLC [12,13]. Previously, we performed a miRNA-seq analysis and discovered that miR-6883-3p, miR-3150a-3p, miR-642a-5p, and miR-627-5p were involved in the growth inhibitory effect of phycocyanin on NSCLC cells [14,15]. However, few studies have investigated the LncRNA expression profiles in phycocyanin-treated NSCLC cell lines. As LncRNA s are the upstream regulators of miRNAs in cells [16], further exploration of the expression profiles of LncRNA s participating in the phycocyanin-mediated antineoplastic process is vital to elucidating the mechanism of phycocyanin-mediated inhibitory effects on NSCLC.

In the present study, to further investigate the precise antineoplastic regulatory mechanism of phycocyanin in NSCLC, a LncRNA-seq was performed to establish the LncRNA profile of NSCLC A549 cells after phycocyanin exposure. The results of this work are expected to explore the anti-tumor mechanism of phycocyanin at the molecular level, which undoubtedly laid a theoretical basis for the potential treatment of NSCLC with phycocyanin and provided insights into the regulatory mechanism of phycocyanin.

**\*Corresponding author:** Shuai Hao, Beijing Engineering and Technology Research Center of Food Additives, Beijing Technology and Business University, Beijing, 100048, China, E-mail: haoshuai@btbu.edu.cn

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## Materials and Methods

### Study information

This work included experimental techniques such as cell migration and cell viability assays, RNA extraction, RNA-seq assay, qRT-PCR, and bioinformatics analysis. The present work was performed in the labs of Beijing Engineering and Technology Research Center of Food Additives, Beijing Technology and Business University in 2023.

### Cell culture and sample treatment

A549 and H460 cells were cultured in DMEM supplemented with 0.1 mg/mL streptomycin, 100 units/mL penicillin and 10% fetal bovine serum (FBS) in a humidified atmosphere with 5% CO<sub>2</sub> at 37 °C (American Type Cell Collection, ATCC, Manassas, VA, USA). Phycocyanin (95% purity) was purchased from Envirolaix (Portland, ME, USA). A549 cells were treated with phycocyanin or PBS as a control, followed by cell lysis and RNA extraction. The control groups were named Con-1, 2 and 3, and the phycocyanin-treated groups were named PC-1, 2 and 3.

### RNA extraction and quality evaluation

The High Pure RNA isolation kit was employed for total RNA extraction according to the manufacturer's specification (Roche, Penzberg, Germany). A Qubit fluorometer (Life Technologies, Eugene, OR, USA) with the Qubit RNA Assay Kit and NanoDrop-1000 instrument were used to evaluate the quality of RNA (Thermo Fisher Scientific Inc., Waltham, USA). The Agilent Bioanalyzer microcapillary electrophoresis system was used to assess RNA quality (Agilent, Santa Clara, CA, USA).

### RNA sequencing

Two milligrams of polyA-minus RNA were used for cDNA library establishment. After total RNAs were extracted, mRNA and noncoding RNAs were enriched by removing rRNA, followed by fragmenting into short fragments (200-500 nt) using EpicentreRibo-Zero™ rRNA RemovalKit (Epicentre, WI, USA). RNA-sequencing libraries were generated under the instructions provided by NEB Next Ultra™ Directional RNA Library Prep kit for Illumina (New England BioLabs, Inc.). The Illumina HiSeq™ 2000 Sequencing System by Berry Genomics Inc. (Beijing, China) was employed for sequencing. Differential expression analysis for LncRNA from the database has proceeded. The sequencing reads were mapped to the reference genome using the TopHat program. A coding potential calculator assay was employed for evaluation. The quality control of raw data was performed using SeqPrep (<https://github.com/jstjohn/SeqPrep>) and Sickle (<https://github.com/najoshi/sickle>). TopHat2 (<http://ccb.jhu.edu/software/tophat/index.shtml>) was used for sequence comparative analysis after quality control. The Cufflinks software (<http://cole-trapnell-lab.github.io/cufflinks/>) was employed for transcript assembly.

### Analysis of differentially expressed (DE) LncRNA s

The number of mapped tags that was given by the raw expression levels of that particular LncRNA. To correct for differences in tag count between samples, the tag counts were scaled to CPM (count per millions) based on the total number of aligned tags. The analysis of differentially expressed LncRNA between control and phycocyanin-treated samples was performed by edgeR. The setting was  $|\log_{2}FC| > 1$  & FDR < 0.05.

### Target genes of LncRNA s and enrichment analysis

KEGG pathway analysis was employed for signal transduction

pathway analysis of key genes. The *p*-value and gene count thresholds of KEGG analysis was *p*-adjust < 0.05 and 7, respectively. Gene Ontology (GO) analysis was used to identify important biological functions or processes of target genes. The *p*-value and gene count thresholds of GO analysis was *p*-adjust < 0.05 and 35, respectively.

### qRT-PCR

qRT-PCR was performed by the Q6 qPCR system. GAPDH was used as the endogenous control gene. SYBR Green Master Mix was used for signal detection. The 2<sup>-ΔΔCT</sup> method was used to calculate the expression of each gene. The primer sequences of LncRNA and GAPDH for qRT-PCR were as follows: forward: 5'-CGTTGCCTACAGT-CAAGTCAGT-3'; reverse: 5'-GCCATGGTTCCTTACTGATAC-3'. Forward: 5'-TGTTTCGTCATGGGTGTGAAC-3'; Reverse: 5'-ATG-GCATGGACTGTGGTCAT-3'.

### Cell viability assay

Cells were cultured in 96-well plates, followed by LncRNA inhibitor incubation for 24 h. The MTT method was employed to determine the viability of A549 cells at 24 and 48 h. Briefly, MTT was added to each well for 4 h, followed by HCl-SDS lysis buffer and the cells were incubated for 24 h. The absorbance at 570 nm was recorded using a micro plate reader.

### Cell migration assay

Cells were incubated with LncRNA inhibitor and cultured in 6-well plates. A pipette tip was used to scratch the cells and create a "wound". Each wound was observed at three different positions and its width was recorded. The three width values were averaged. The widths of the wounds were observed at 0 and 24 h. The cell migration rate was calculated from the difference in scratch width at 24 h over the original width (0 h).

### Statistical Analysis

The data were analyzed by Microsoft Excel and GraphPad Prism. A two-tailed Student's t test (paired t-test) was used for data analysis, and *p* < 0.05 indicated a significant difference between the control and test groups.

## Results and Discussion

### Classification and subgroup analysis of LncRNA s

Phycocyanin has been reported to exert effective antineoplastic effects on NSCLC cells [12,13]. Further investigation of the underlying anticancer mechanism of phycocyanin can help clarify the pathogenesis of NSCLC, laying the theoretical basis for lung cancer treatment. LncRNA s are well-known important molecules that regulate gene expression at the transcriptional, epigenetic, and posttranscriptional levels [17]. Numerous LncRNA s have been identified by high-throughput technology and are related to growth and development in cancer cells.

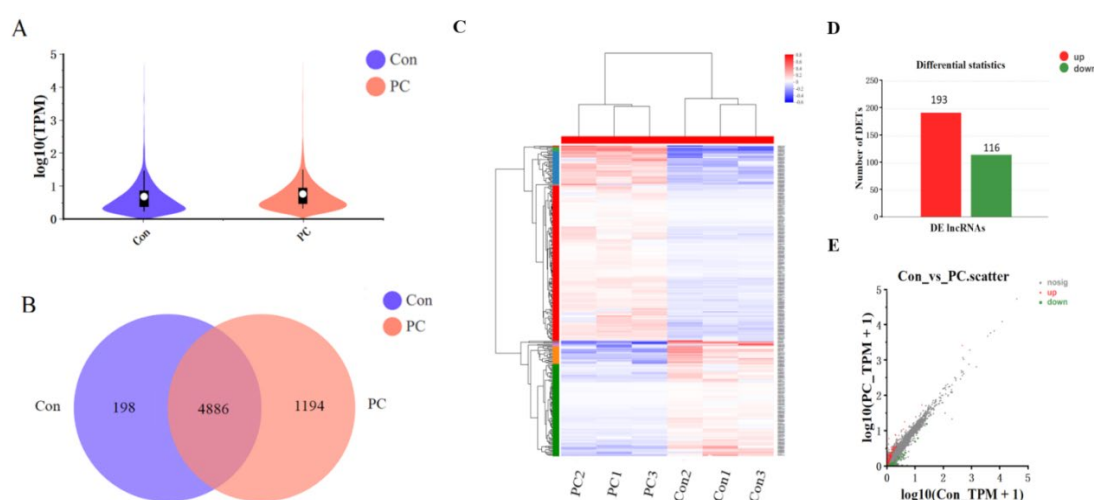
Over 26,000 LncRNA s (including known and novel LncRNA s) was identified in the Con and PC groups (Table S1). The chromosomal distribution and transcript types of LncRNA s were determined. In Table S2, of the antisense LncRNA s, the known LncRNA s accounted for 93.5%. Of the sense intron overlap, the known LncRNA s accounted for 96.1%. Of the intergenic LncRNA s, the known LncRNA s accounted for 99.4%. Of the sense exon overlap, the known LncRNA s accounted for 95.0%. Of the bidirectional LncRNA s, the known LncRNA s accounted for 99.9%.

**Table S1:** Statistics of lncRNAs.

Sample	Known lncRNA num	Novel lncRNA num	Total
Con-1	25,075	1,458	26,533
Con-2	24,543	1,464	26,007
Con-3	25,111	1,486	26,597
PC-1	25,334	1,468	26,802
PC-2	25,836	1,481	27,317
PC-3	25,738	1,483	27,221

**Table S2:** Classification and subgroup of lncRNAs.

Type	Known lncRNA num	Novel lncRNA num	Total
Antisense	17768	1224	18992
Sense intron overlap	615	25	640
Intergenic	36889	207	37096
Sense exon overlap	6813	362	7175
Bidirection	5147	2	5149



**Figure 1:** The expression analysis of lncRNAs. (A) The violin figure of expression pattern of lncRNAs in Con and PC groups. (B) Venn figure of the lncRNA numbers in Con and PC groups. (C) Heatmap of DE lncRNAs in each sample. Blue indicates low expression levels, red indicates high expression levels. (D) Number of DE lncRNAs between Con and PC groups. (E) Scatter diagram of DE lncRNAs. Red indicates upregulated lncRNAs, and green represents downregulated lncRNAs.

### Analysis of lncRNA expression and differentially expressed (DE) lncRNAs

As shown in Figure 1A, the lncRNA expression patterns of the Con and PC samples were similar, indicating the suitable replication of each experiment. Finally, 5,084 and 6,080 lncRNA transcripts were obtained from the Con and PC groups, respectively, after eliminating the single-exon, low-expression, and unreliable fragments. Of these, 4886 lncRNAs were found in both Con and PC samples (Figure 1B). Table S3 presents the top 15 lncRNAs that are expressed in the Con and PC groups based on TPM (transcripts per million reads). Strikingly, some lncRNAs were highly expressed in both the Con and PC groups, including ENST00000602361, ENST00000554988, ENST00000618589, and ENST00000659240. Some lncRNAs exhibited sample-specific expression. For instance, NONHSAT135828.2 and ENST00000508832 were specifically highly expressed in phycocyanin-treated A549 cells, while NONHSAT190639.1 and NONHSAT176665.1 were specifically highly expressed in control cells.

The heat map of differentially expressed lncRNAs showed that the expression patterns of lncRNAs within Con or PC samples were consistent, while the expression profiles between Con and PC groups

exerted extremely significant differences (Figure 1C), indicating the effects of phycocyanin on the expression of lncRNAs in A549 cells. In total, 309 lncRNAs exhibited significant expression differences between the Con and PC groups, including 193 significantly upregulated and 116 significantly downregulated lncRNAs after phycocyanin treatment in A549 cells (Figure 1D). The scatter diagram of DE lncRNAs is shown in Figure 1E. The detailed information of DE lncRNAs was shown in Table S4. This lncRNA is likely to be key lncRNAs that may act as downstream targets of phycocyanin in NSCLC cells. Table S5 shows the top 10 downregulated and top 10 upregulated lncRNA transcripts.

### GO and KEGG enrichment analyses of DE lncRNAs and predicted targets

The DE lncRNAs were annotated by KEGG and GO enrichment analyses. Figure 2A shows the top 20 GO entries. Moreover, several of the GO items were related to cell activities, including GO: 0006955 (immune response), GO: 0070613 (regulation of protein processing), GO: 2000257 (regulation of protein activation cascade), GO: 1903034 (regulation of response to wounding), and GO: 0006952 (defense response). Figure 2B shows the KEGG pathway enrichment results.

**Table S3:** The top expressed 15 lncRNA transcripts in Con and PC groups.

Con		PC	
lncRNAs	TPM	lncRNAs	TPM
ENST00000602361	58511.15	ENST00000602361	64810.17
ENST00000554988	16530.64	ENST00000554988	14324.52
ENST00000618589	8645.37	ENST00000618589	7671.39
NONHSAT243766.1	6137.81	NONHSAT243766.1	6700.25
ENST00000659240	4918.28	ENST00000659240	5387.17
NONHSAT052027.2	2032.83	NONHSAT135828.2	2919.21
NONHSAT146442.2	1884.87	ENST00000610851	2154.29
ENST00000618227	1408.33	ENST00000618227	2010.76
ENST00000616691	1106.53	ENST00000616691	1871.71
NONHSAT021728.2	1076.28	NONHSAT052027.2	1701.58
ENST00000610851	1071.01	ENST00000508832	1288.08
ENST00000541782	994.52	ENST00000534336	1157.87
NONHSAT190639.1	910.08	NONHSAT021728.2	977.59
ENST00000534336	625.55	ENST00000541782	838.71
NONHSAT176665.1	594.18	NONHSAT146442.2	707.9

**Table S4:** The detailed information of DE lncRNAs.

lncRNA id	lncRNA gene id	FC(PC/Con)	Log2FC(PC/Con)	Pvalue	Padjust	Significant	Regulate	Con1	Con2	Con3	PC1	PC2	PC3	Con	PC
ENST00000375633	ENSG00000204387	2.216937934	1.148568381	0.00064	0.00839	yes	up	4.85	2.08	4.42	9.61	10.64	8.38	3.78333	9.54333
ENST00000375642	ENSG00000204387	2.252230455	1.171354456	0.00246	0.02563	yes	up	0.82	0.84	1.31	1.79	3.19	2.62	0.99	2.53333
ENST00000383808	ENSG00000206567	2.194757374	1.134061462	0.00024	0.00365	yes	up	0.19	0.21	0.14	0.46	0.49	0.43	0.18	0.46
ENST00000399543	ENSG00000215068	20.55209258	4.361213389	7.3E-05	0.00128	yes	up	0	0	0.04	0.3	0.46	0.28	0.01333	0.34667
ENST00000399868	ENSG00000215244	74.36631846	6.216577447	0.00018	0.00285	yes	up	0	0	0	0.25	0.09	0.06	0	0.13333
ENST00000413221	ENSG00000224032	0.497442355	-1.007398742	0.00198	0.02144	yes	down	0.94	1.32	1.76	0.87	0.84	0.6	1.34	0.77
ENST00000416463	ENSG00000242282	58.76533342	5.876893433	0.00181	0.01999	yes	up	0	0	0	0.9	0.24	2.18	0	1.10667
ENST00000418927	ENSG00000235269	0.0321649	-4.958369	0.0007	0.00903	yes	down	0.09	0.12	0.19	0	0	0.01	0.13333	0.00333
ENST00000422944	ENSG00000228022	74.47820287	6.218746356	0.00042	0.00589	yes	up	0	0	0	0.08	0.3	0.71	0	0.36333
ENST00000423477	ENSG00000225439	127.2206537	6.991189095	1.3E-05	0.00027	yes	up	0	0	0	0.75	0.34	0.12	0	0.40333
ENST00000424518	ENSG00000228630	56.7453908	5.826431308	0.00018	0.00285	yes	up	0	0	0	0.1	0.12	0.17	0	0.13
ENST00000424684	ENSG00000263590	2.676037221	1.420098183	4.5E-05	0.00083	yes	up	0.14	0.1	0.18	0.36	0.52	0.39	0.14	0.42333
ENST00000426023	ENSG00000237807	0.204739826	-2.288136334	0.00154	0.01755	yes	down	0.14	0.22	0.19	0.05	0.04	0.05	0.18333	0.04667
ENST00000428862	ENSG00000224596	2.373646048	1.24710482	0.00087	0.01084	yes	up	0.24	0.22	0.2	0.72	0.42	0.68	0.22	0.60667
ENST00000430034	ENSG00000240801	4.690574082	2.229764506	2.6E-16	3.4E-14	yes	up	4.07	2.77	2.9	17.97	19.01	15.26	3.24667	17.4133
ENST00000430373	ENSG00000227811	135.5234258	7.082398439	1.2E-07	4.1E-06	yes	up	0	0	0	0.37	0.37	0.27	0	0.33667
ENST00000432735	ENSG00000215424	3.300294589	1.722594807	0.00066	0.00858	yes	up	0.24	0.22	0.72	1.49	1.73	1.26	0.39333	1.49333
ENST00000434233	ENSG00000218510	0.358038271	-1.481814289	0.00102	0.0124	yes	down	1.83	1.17	1.99	0.78	0.41	0.84	1.66333	0.67667
ENST00000435356	ENSG00000203392	2.104257514	1.073311269	3.2E-06	7.9E-05	yes	up	0.8	0.7	0.67	1.68	1.56	2.01	0.72333	1.75
ENST00000439559	ENSG00000224914	2.551430127	1.351306133	2.6E-09	1.3E-07	yes	up	0.5	0.45	0.62	1.62	1.28	1.68	0.52333	1.52667
ENST00000441052	ENSG00000235314	97.64557286	6.60948273	2.1E-06	5.5E-05	yes	up	0	0	0	0.25	0.2	0.17	0	0.20667
ENST00000443596	ENSG00000234608	0.006900498	-7.179083786	1.8E-06	4.7E-05	yes	down	1.6	0.75	0.37	0	0	0	0.90667	0
ENST00000443993	ENSG00000227619	0.009553142	-6.709809046	0.00024	0.00364	yes	down	0.02	0.31	0.31	0	0	0	0.21333	0
ENST00000444503	ENSG00000232490	0.020634848	-5.5987734	0.00229	0.02411	yes	down	1.29	0.4	0.18	0	0	0	0.62333	0
ENST00000444998	ENSG00000215424	0.043504416	-4.522694346	6.4E-06	0.00015	yes	down	0.58	0.43	0.49	0.08	0	0	0.5	0.02667
ENST00000455395	ENSG00000230590	34.18808119	5.095421549	2.2E-05	0.00045	yes	up	0.06	0	0	0.32	0.73	1.13	0.02	0.72667
ENST00000456953	ENSG00000196756	0.014481228	-6.109672284	0.00011	0.00184	yes	down	0.63	0.23	0.27	0	0	0	0.37667	0
ENST00000457670	ENSG00000228412	0.017289583	-5.853953131	0.00061	0.00804	yes	down	0.11	0.3	0.07	0	0	0	0.16	0
ENST00000458178	ENSG00000224086	2.081220275	1.057429667	5.3E-05	0.00095	yes	up	0.04	0.05	0.04	0.12	0.09	0.1	0.04333	0.10333
ENST00000466953	ENSG00000254154	2.455148772	1.295810448	0.00474	0.04321	yes	up	0.05	0.05	0.05	0.18	0.12	0.12	0.05	0.14
ENST00000475197	ENSG00000231177	39.90459136	5.318482845	1.3E-37	1.1E-34	yes	up	0.14	0.16	0.03	5.69	4.92	4.71	0.11	5.10667
ENST00000488584	ENSG00000240875	0.003520513	-8.149998575	5.1E-09	2.4E-07	yes	down	0.52	0.16	0.65	0	0	0	0.44333	0
ENST00000498979	ENSG00000245248	0.398254693	-1.328236734	0.00558	0.04934	yes	down	0.34	0.48	0.26	0.17	0.16	0.18	0.36	0.17
ENST00000500698	ENSG00000245522	2.781788251	1.476012607	0.00048	0.0066	yes	up	0.19	0.16	0.12	0.46	0.56	0.49	0.15667	0.50333
ENST00000501122	ENSG00000245532	2.811058729	1.491113595	1E-105	2E-101	yes	up	18.09	15.14	18.49	59.35	52.11	55	17.24	55.4867
ENST00000503469	ENSG00000250041	0.027805182	-5.168502408	0.00385	0.03684	yes	down	0.58	0.32	0.98	0	0	0	0.62667	0
ENST00000523313	ENSG00000249395	0.018744053	-5.737423242	0.00097	0.01187	yes	down	0.49	0.23	1.17	0	0	0	0.63	0
ENST00000526566	ENSG00000255438	157.724407	7.301262117	0.00157	0.01777	yes	up	0	0	0	0.6	0	0.46	0	0.35333
ENST00000534918	ENSG00000225138	3.284735992	1.71577742	3.8E-08	1.5E-06	yes	up	0.37	0.3	0.19	1.11	1	1.12	0.28667	1.07667



ENST00000538717	ENSG00000231177	0.000963561	-10.01933648	5.9E-17	8.4E-15	yes	down	4.64	3.6	4.4	0	0	0	4.21333	0
ENST00000547387	ENSG00000258017	0.359580402	-1.475613701	4.7E-06	0.00011	yes	down	3.25	3.45	3.6	1.33	1.93	0.95	3.43333	1.40333
ENST00000550290	ENSG00000257354	16.18316295	4.016421701	8.7E-17	1.2E-14	yes	up	0.02	0.04	0.09	0.71	0.84	1.17	0.05	0.90667
ENST00000555578	ENSG00000258701	120.6971396	6.915247676	1.1E-06	3.1E-05	yes	up	0	0	0	0.18	0.23	0.38	0	0.26333
ENST00000562992	ENSG00000260693	2.434028955	1.28334633	5.1E-05	0.00093	yes	up	1.39	1.35	0.99	3.94	3.18	3.29	1.24333	3.47
ENST00000569326	ENSG00000255182	2.01035948	1.007453498	0.00044	0.00616	yes	up	0.28	0.27	0.24	0.55	0.71	0.57	0.26333	0.61
ENST00000571963	ENSG00000263072	0.012286251	-6.346811482	6.7E-05	0.00117	yes	down	0.27	0.41	0.11	0	0	0	0.26333	0
ENST00000572035	ENSG00000255135	134.2814143	7.069115827	1.7E-06	4.5E-05	yes	up	0	0	0	1.5	0.51	1.61	0	1.20667
ENST00000576232	ENSG00000224870	59.42880362	5.893090433	0.00014	0.00224	yes	up	0	0.02	0	0.88	0.82	0.47	0.00667	0.72333
ENST00000602890	ENSG00000269888	0.487903558	-1.035332091	0.00435	0.0405	yes	down	22.65	37.62	20.15	14.19	18.24	12.9	26.8067	15.11
ENST00000606343	ENSG00000272068	2.088855178	1.062712473	7E-10	3.8E-08	yes	up	1.09	0.85	1.21	2.54	2.32	2.69	1.05	2.51667
ENST00000606892	ENSG00000231889	34.48069722	5.107717042	0.00037	0.0052	yes	up	0	0	0.05	0.78	0.5	0.52	0.01667	0.6
ENST00000609111	ENSG00000272734	2.419563751	1.274746952	0.00064	0.00843	yes	up	0.41	0.25	0.21	0.58	1.01	0.79	0.29	0.79333
ENST00000609983	ENSG00000234608	0.290601301	-1.782886935	0.00223	0.02364	yes	down	2.59	3.9	3.04	0.3	1.25	1.56	3.17667	1.03667
ENST00000612722	ENSG00000275620	2.736120192	1.452131606	2.3E-08	9.2E-07	yes	up	0.17	0.25	0.28	0.63	0.84	0.71	0.23333	0.72667
ENST00000615493	ENSG00000242086	0.007129691	-7.131944741	3.6E-06	9E-05	yes	down	0.38	1.22	2.01	0	0	0	1.20333	0
ENST00000628917	ENSG00000242086	0.010493388	-6.574375663	6.2E-06	0.00014	yes	down	2	1.33	0.86	0.04	0	0	1.39667	0.01333
ENST00000632919	ENSG00000233871	2.338666909	1.225686397	0.0021	0.0225	yes	up	0.17	0.2	0.19	0.48	0.51	0.52	0.18667	0.50333
ENST00000648209	ENSG00000255248	69.55296901	6.120040195	6.4E-05	0.00113	yes	up	0	0	0	0.2	0.11	0.09	0	0.13333
ENST00000650025	ENSG00000236204	137.239545	7.100552438	0.00235	0.02466	yes	up	0	0	0	0.56	0.56	0	0	0.37333
ENST00000651080	ENSG00000234741	0.016455684	-5.925270221	0.00026	0.00381	yes	down	0.5	0.12	0.34	0	0	0	0.32	0
ENST00000651958	ENSG00000280441	2.853676227	1.512821658	0.00104	0.0126	yes	up	0.36	0.76	0.64	1.7	2.31	1.69	0.58667	1.9
ENST00000652379	ENSG00000280441	2.168376705	1.116615413	0.00308	0.03073	yes	up	0.89	0.76	0.64	1.7	2.31	1.69	0.76333	1.9
ENST00000652496	ENSG00000230590	2.712508216	1.439627507	0.00093	0.01155	yes	up	0.19	0.15	0.26	0.72	0.51	0.62	0.2	0.61667
ENST00000652746	ENSG00000233237	0.204178555	-2.292096749	0.00203	0.02194	yes	down	0.6	0.61	0.4	0.18	0.17	0.02	0.53667	0.12333
ENST00000653437	ENSG00000253190	0.014712341	-6.08682934	6.9E-05	0.00121	yes	down	0.31	0.63	0.34	0	0	0	0.42667	0
ENST00000653856	ENSG00000257261	0.015395207	-6.021374887	6.1E-05	0.00109	yes	down	0.5	0.27	0.54	0	0	0	0.43667	0
ENST00000654005	ENSG00000225470	566.8307621	9.146774246	3E-11	2E-09	yes	up	0	0	0	1	0.22	0.43	0	0.55
ENST00000654166	ENSG00000183250	105.6221692	6.722768866	0.00499	0.04512	yes	up	0	0	0	0.25	0.34	0	0	0.19667
ENST00000654981	ENSG00000249406	55.73493256	5.800509933	0.0002	0.00313	yes	up	0	0	0	0.34	0.19	0.24	0	0.25667
ENST00000655003	ENSG00000229043	90.72621219	6.503447523	0.00118	0.01404	yes	up	0	0	0	0.23	0.02	0.62	0	0.29
ENST00000655030	ENSG00000231105	50.36628587	5.654386442	0.00067	0.00875	yes	up	0	0	0	0.23	0.07	0.12	0	0.14
ENST00000655308	ENSG00000286483	0.047739545	-4.388671359	0.00455	0.04193	yes	down	0.53	0.25	0.29	0	0	0.06	0.35667	0.02
ENST00000655351	ENSG00000272695	65.0106122	6.022603335	0.00014	0.00218	yes	up	0	0	0	0.25	0.12	0.3	0	0.22333
ENST00000655606	ENSG00000223745	3.904617781	1.965181331	1E-06	2.8E-05	yes	up	0.34	0.64	0.24	1.62	1.73	2.18	0.40667	1.84333
ENST00000656647	ENSG00000261824	0.025922263	-5.269664523	0.00426	0.03986	yes	down	0.31	0.1	0.07	0	0	0	0.16	0
ENST00000656756	ENSG00000259583	3.744799819	1.9048886	0.00067	0.00869	yes	up	0.13	0.21	0.61	1.74	1.09	1.23	0.31667	1.35333
ENST00000657056	ENSG00000286656	2.775175715	1.472579121	0.00432	0.04024	yes	up	0.21	0.22	0.13	0.56	0.65	0.56	0.18667	0.59
ENST00000657070	ENSG00000230590	0.010255411	-6.607470867	7.9E-05	0.00137	yes	down	0.08	0.52	0.26	0	0	0	0.28667	0
ENST00000657179	ENSG00000225470	154.6829687	7.273170548	0.00177	0.01963	yes	up	0	0	0	0.18	0	0.3	0	0.16
ENST00000657211	ENSG00000249859	50.0528901	5.645381469	0.00502	0.04536	yes	up	0	0	0	0.04	0.44	0.19	0	0.22333
ENST00000657677	ENSG00000261824	2.306289108	1.205573375	0.0045	0.04156	yes	up	0.43	0.24	0.3	1.12	0.41	1.04	0.32333	0.85667
ENST00000657910	ENSG00000225470	0.00355346	-8.136559685	6.5E-10	3.5E-08	yes	down	1.04	0.99	0.48	0	0	0	0.83667	0
ENST00000658183	ENSG00000255248	82.32441279	6.363248411	1E-05	0.00023	yes	up	0	0	0	0.46	0.42	0.29	0	0.39
ENST00000658188	ENSG00000228889	15.44441864	3.949013661	0.00047	0.00647	yes	up	0.06	0	0	0.39	0.36	0.3	0.02	0.35
ENST00000658695	ENSG00000231074	0.012796004	-6.288162859	0.00141	0.01628	yes	down	0	0.09	0.08	0	0	0	0.05667	0
ENST00000658813	ENSG00000223546	0.196243661	-2.349282039	0.00128	0.01501	yes	down	0.61	1.07	0.55	0.25	0.02	0.24	0.74333	0.17
ENST00000658859	ENSG00000224078	154.7157098	7.273475885	3.4E-08	1.3E-06	yes	up	0	0	0	0.21	0.2	0.15	0	0.18667
ENST00000658963	ENSG00000227388	5.104968491	2.351902056	0.00076	0.00972	yes	up	0.06	0.07	0.13	0.3	0.6	0.56	0.08667	0.48667
ENST00000659892	ENSG00000249859	0.023957439	-5.383382498	0.00124	0.01463	yes	down	0.2	0.31	0.45	0	0	0	0.32	0
ENST00000659899	ENSG00000241316	91.38853589	6.513941295	4.7E-05	0.00085	yes	up	0	0	0	0.32	0.07	0.18	0	0.19
ENST00000659912	ENSG00000249859	64.67391991	6.01511215	0.00122	0.01447	yes	up	0	0	0	0.19	0.04	0.39	0	0.20667
ENST00000660010	ENSG00000257114	14.74642391	3.88229323	0.00116	0.0138	yes	up	0	0.1	0	0.74	0.53	0.45	0.03333	0.57333
ENST00000660030	ENSG00000263753	0.008190606	-6.931814024	2.6E-07	8.5E-06	yes	down	0.14	0.12	0.17	0	0	0	0.14333	0
ENST00000660248	ENSG00000236144	2.746065006	1.457365778	0.0005	0.00677	yes	up	0.22	0.14	0.24	0.44	0.71	0.73	0.2	0.62667
ENST00000660374	ENSG00000223960	0.012959352	-6.269862557	1.7E-05	0.00035	yes	down	0.27	0.19	0.34	0	0	0	0.26667	0
ENST00000660542	ENSG00000224078	169.7151079	7.406971188	0.00113	0.01355	yes	up	0	0	0	0	0.18	0.18	0	0.12
ENST00000660547	ENSG00000255717	0.381074532	-1.3918549	0.00032	0.00465	yes	down	4.02	1.66	4.28	1.11	1.52	1.67	3.32	1.43333
ENST00000660608	ENSG00000232931	3.358055155	1.747625926	1.6E-07	5.6E-06	yes	up	0.27	0.2	0.24	0.96	0.89	0.92	0.23667	0.92333
ENST00000662234	ENSG00000248932	5.299729337	2.405918682	4.8E-05	0.00088	yes	up	0.06	0.04	0.05	0.25	0.26	0.45	0.05	0.32
ENST00000662245	ENSG00000203875	0.019208769	-5.702091087	1.2E-05	0.00025	yes	down	1.1	1.69	0.46	0	0	0.07	1.08333	0.02333

ENST00000662517	ENSG00000287300	0.049542159	-4.335199434	0.00081	0.01027	yes	down	0.13	0.14	0.17	0.02	0	0	0.14667	0.00667
ENST00000662585	ENSG00000266903	15.17084775	3.923229801	0.00032	0.00463	yes	up	0	0.01	0.06	0.49	0.56	0.21	0.02333	0.42
ENST00000662995	ENSG00000233828	0.093942816	-3.412073354	0.00538	0.04788	yes	down	0.18	0.16	0.23	0	0	0.06	0.19	0.02
ENST00000663248	ENSG00000189223	67.35267698	6.073663383	8.4E-05	0.00144	yes	up	0	0	0	0.06	0.05	0.02	0	0.04333
ENST00000663347	ENSG00000287275	2.049996816	1.035621669	0.00202	0.0218	yes	up	0.37	0.26	0.22	0.64	0.66	0.69	0.28333	0.66333
ENST00000663448	ENSG00000203875	0.067900738	-3.880428928	0.00107	0.01291	yes	down	0.54	0.54	0.53	0	0	0.13	0.53667	0.04333
ENST00000664934	ENSG00000263753	0.007109624	-7.136010945	2.5E-05	0.00048	yes	down	0.04	0.43	0.2	0	0	0	0.22333	0
ENST00000664939	ENSG00000175061	2.783669177	1.476987765	6E-07	1.8E-05	yes	up	0.41	0.32	0.54	1.05	1.51	1.44	0.42333	1.33333
ENST00000665650	ENSG00000227373	0.027988853	-5.159003825	0.00221	0.02345	yes	down	0.04	0.02	0.03	0	0	0	0.03	0
ENST00000667654	ENSG00000274265	0.402399911	-1.313298109	0.00103	0.01248	yes	down	1.29	2.24	1.79	0.81	0.79	0.85	1.77333	0.81667
ENST00000667709	ENSG00000247311	36.03784189	5.171440713	0.00456	0.04199	yes	up	0	0	0	0.22	0.11	0.39	0	0.24
ENST00000667751	ENSG00000288093	2.090481995	1.063835618	0.00187	0.02055	yes	up	0.37	0.31	0.3	0.77	0.89	0.71	0.32667	0.79
ENST00000667900	ENSG00000243176	0.008450125	-6.886811629	1.4E-06	3.9E-05	yes	down	0.21	0.19	0.09	0	0	0	0.16333	0
ENST00000668204	ENSG00000266401	63.8301153	5.996165349	0.00013	0.00205	yes	up	0	0	0	0.59	0.29	0.24	0	0.37333
ENST00000668253	ENSG00000248008	0.329390681	-1.602128355	0.0008	0.01012	yes	down	3.28	3.81	3.6	2.35	1.2	0.57	3.56333	1.37333
ENST00000669486	ENSG00000253686	41.59225734	5.378243081	0.00134	0.01566	yes	up	0	0	0	0.06	0.06	0.11	0	0.07667
ENST00000670381	ENSG00000286715	2.058251654	1.041419386	0.00455	0.0419	yes	up	1.15	1.1	0.67	2.64	2.25	2.04	0.97333	2.31
ENST00000670471	ENSG00000251138	182.0182442	7.507939253	9.4E-09	4.1E-07	yes	up	0	0	0	0.23	0.24	0.32	0	0.26333
ENST00000671055	ENSG00000228065	75.19950294	6.232651221	8.1E-05	0.0014	yes	up	0	0	0	0.14	0.42	0.18	0	0.24667
ENST00000671088	ENSG00000249859	0.023354048	-5.420183557	0.00095	0.01175	yes	down	0.24	0.21	0.11	0	0	0	0.18667	0
NONHSAT000917.2	ENSG00000177000	5.349964383	2.419529287	0.00428	0.03993	yes	up	0.36	0.04	0.12	0.85	1.19	1.01	0.17333	1.01667
NONHSAT002797.2	ENSG00000234694	23.17677341	4.534607828	0.00395	0.03751	yes	up	0	0	0.04	0.15	0.28	0.39	0.01333	0.27333
NONHSAT003731.2	ENSG00000162433	4.409935348	2.140757505	3.1E-05	0.00059	yes	up	0.28	0.08	0.16	0.8	0.66	1.17	0.17333	0.87667
NONHSAT004497.2	ENSG00000223745	151.2449954	7.240743595	0.00169	0.01887	yes	up	0	0	0	0	0.43	0.28	0	0.23667
NONHSAT005858.2	ENSG00000255148	39.11650079	5.289705413	0.00562	0.04968	yes	up	0	0	0	1.16	0.2	0.57	0	0.64333
NONHSAT010087.2	ENSG00000223635	0.027804151	-5.168555896	0.00198	0.02151	yes	down	0.11	0.1	0.06	0	0	0	0.09	0
NONHSAT011652.2	ENSG00000165997	3.012245344	1.590839281	0.00414	0.03892	yes	up	0.1	0.48	0.3	1.04	0.79	1.3	0.29333	1.04333
NONHSAT013767.2	ENSG00000165732	0.380525283	-1.393935782	0.00273	0.02789	yes	down	9.91	18.1	7.75	6.99	3.66	5.11	11.92	5.25333
NONHSAT015087.2	ENSG00000224596	9.684439842	3.275668604	9.3E-05	0.00159	yes	up	0.04	0.09	0	0.46	0.48	0.67	0.04333	0.53667
NONHSAT015626.2	ENSG00000180628	3.929728033	1.97442947	7.6E-05	0.00132	yes	up	0.3	0.09	0.37	0.89	1.28	1.26	0.25333	1.14333
NONHSAT031960.2	ENSG00000250208	0.005530793	-7.498298006	6.2E-08	2.3E-06	yes	down	0.09	0.03	0.06	0	0	0	0.06	0
NONHSAT032174.2	ENSG00000271963	0.0180873	-5.788879149	3.9E-13	3.4E-11	yes	down	0.39	0.71	0.39	0.01	0.02	0	0.49667	0.01
NONHSAT054508.2	ENSG00000159217	1397.657961	10.44879563	7.2E-18	1.1E-15	yes	up	0	0	0	1.67	2.48	2.6	0	2.25
NONHSAT055465.2	ENSG00000278730	0.38439749	-1.379329179	1.8E-11	1.2E-09	yes	down	0.9	0.84	0.85	0.32	0.32	0.49	0.86333	0.37667
NONHSAT070449.2	ENSG00000286728	0.329113738	-1.603341845	0.00046	0.00631	yes	down	0.55	0.33	0.36	0.16	0.18	0.13	0.41333	0.15667
NONHSAT075745.2	ENSG00000223960	103.3545509	6.691458105	0.00528	0.04721	yes	up	0	0	0	0.09	0	0.07	0	0.05333
NONHSAT085106.2	ENSG00000223695	2.023693863	1.016991061	0.00443	0.04105	yes	up	0.07	0.13	0.11	0.22	0.29	0.21	0.10333	0.24
NONHSAT096667.2	ENSG00000248479	2.234244795	1.159787264	2.8E-05	0.00054	yes	up	0.62	0.62	0.97	1.45	2.13	2.05	0.73667	1.87667
NONHSAT104164.2	ENSG00000254363	0.006623946	-7.238093401	0.00206	0.02215	yes	down	0.09	0.23	0	0	0	0	0.10667	0
NONHSAT104167.2	ENSG00000254363	433.6863699	8.760508292	1.9E-11	1.3E-09	yes	up	0	0	0	0.19	0.48	0.36	0	0.34333
NONHSAT106651.2	ENSG00000250903	2.017401454	1.012498203	0.0049	0.04446	yes	up	0.49	0.27	0.3	0.89	0.84	0.75	0.35333	0.82667
NONHSAT112918.2	ENSG00000272114	3.193587568	1.67517801	1.4E-11	9.7E-10	yes	up	3.19	2.23	3.09	8	11.31	11.69	2.83667	10.3333
NONHSAT119869.2	ENSG00000281404	0.008213723	-6.92774801	0.004	0.03786	yes	down	0.08	0	0.27	0	0	0	0.11667	0
NONHSAT120520.2	ENSG00000136275	2.660567793	1.411734165	3.6E-05	0.00068	yes	up	0.27	0.17	0.23	0.73	0.65	0.68	0.22333	0.68667
NONHSAT123250.2	ENSG00000128595	6.693069277	2.742667947	0.004	0.03786	yes	up	0.99	0	1.79	6.13	10.15	4.37	0.92667	6.88333
NONHSAT124335.2	ENSG00000273344	72.22378437	6.174402111	2.5E-05	0.00049	yes	up	0	0	0	0.09	0.12	0.08	0	0.09667
NONHSAT124336.2	ENSG00000273344	0.023759464	-5.395353899	4.7E-06	0.00011	yes	down	0.17	0.16	0.24	0	0.01	0	0.19	0.00333
NONHSAT124679.2	ENSG00000253982	0.026652809	-5.229568602	0.00519	0.04657	yes	down	0.2	0.06	0.32	0	0	0	0.19333	0
NONHSAT125770.2	ENSG00000259366	3.012218194	1.590826277	0.00192	0.02101	yes	up	0.04	0.03	0.05	0.19	0.11	0.12	0.04	0.14
NONHSAT129048.2	ENSG00000249859	0.021647986	-5.529623406	0.00042	0.00592	yes	down	0.02	0.01	0.02	0	0	0	0.01667	0
NONHSAT130177.2	ENSG00000273056	0.318129095	-1.652315773	0.002	0.02165	yes	down	0.16	0.13	0.12	0.04	0.06	0.06	0.13667	0.05333
NONHSAT135554.2	ENSG00000237886	291.9165981	8.189412433	5.9E-09	2.7E-07	yes	up	0	0	0	0.09	0.05	0.18	0	0.10667
NONHSAT135828.2	ENSG00000198886	4.536264858	2.181504877	2E-289	5E-285	yes	up	564.05	590.65	520.4	3067.92	2814.19	2875.53	558.367	2919.21
NONHSAT140312.2	ENSG00000140632	2.664694407	1.413970091	0.00463	0.04246	yes	up	2.21	0.46	0.92	3.56	3.47	3.78	1.19667	3.60333
NONHSAT140811.2	ENSG00000103489	0.144705438	-2.788808957	0.00438	0.04066	yes	down	0.43	0.74	0.3	0.1	0.14	0	0.49	0.08
NONHSAT141673.2	ENSG00000247735	0.285776273	-1.807041958	9.2E-05	0.00156	yes	down	0.62	0.63	0.5	0.08	0.3	0.19	0.58333	0.19
NONHSAT146423.2	ENSG00000265185	0.479451357	-1.06054364	7.2E-08	2.6E-06	yes	down	216.39	300.45	192.03	126.78	138.9	127.7	236.29	131.127
NONHSAT147157.2	ENSG00000232712	0.157583649	-2.665810244	0.00353	0.0343	yes	down	0.64	1.27	0.86	0.23	0.28	0	0.92333	0.17
NONHSAT149933.1	ENSG00000227741	2.580803109	1.367820082	0.00518	0.0465	yes	up	0.34	0.13	0.35	0.95	0.54	0.9	0.27333	0.79667
NONHSAT151562.1	ENSG00000225762	35.85314706	5.164027854	0.0032	0.03168	yes	up	0	0	0	0.12	0.25	0.13	0	0.16667
NONHSAT156012.1	ENSG00000269609	0.028668651	-5.124382147	0.00305	0.03046	yes	down	0.02	0.04	0.03	0	0	0	0.03	0

NONHSAT156977.1	ENSG00000231187	17.9481356	4.165762084	0.00044	0.00616	yes	up	0	0.05	0	0.23	0.49	0.35	0.01667	0.35667
NONHSAT157019.1	ENSG00000231131	2.247688622	1.168442189	0.00344	0.03367	yes	up	0.07	0.09	0.05	0.15	0.21	0.2	0.07	0.18667
NONHSAT158734.1	ENSG00000226416	2.074086674	1.052476184	0.0035	0.0341	yes	up	0.33	0.24	0.38	0.97	0.69	0.6	0.31667	0.75333
NONHSAT159591.1	ENSG00000234445	0.213486795	-2.227781258	0.0017	0.01891	yes	down	1.54	3.17	1.44	0.84	0.54	0.14	2.05	0.50667
NONHSAT172961.1	ENSG00000260086	42.10897397	5.396055818	0.00226	0.02383	yes	up	0	0	0	0.47	0.14	0.56	0	0.39
NONHSAT175847.1	ENSG00000074370	2.476704752	1.308421895	1.3E-08	5.7E-07	yes	up	0.86	0.73	0.82	2.71	2.21	1.96	0.80333	2.29333
NONHSAT180109.1	ENSG00000267484	0.00826188	-6.919314194	3.3E-06	8.3E-05	yes	down	1.67	0.47	0.8	0	0	0	0.98	0
NONHSAT181266.1	ENSG00000162976	0.363485906	-1.460028668	0.00013	0.00211	yes	down	3.4	2.18	2.6	0.64	1.13	1.58	2.72667	1.11667
NONHSAT183309.1	ENSG00000235852	0.003084757	-8.340627501	7E-08	2.6E-06	yes	down	0.53	0.81	5.91	0.04	0	0	2.41667	0.01333
NONHSAT186058.1	ENSG00000224063	2.032699557	1.023396993	0.00357	0.03463	yes	up	0.52	0.67	0.74	1.49	1.58	1.49	0.64333	1.52
NONHSAT189966.1	ENSG00000228705	0.010830569	-6.528747201	5.8E-06	0.00014	yes	down	0.01	0.03	0.02	0	0	0	0.02	0
NONHSAT193047.1	ENSG00000273253	0.019694453	-5.666066855	0.00058	0.00768	yes	down	0.02	0.04	0.03	0	0	0	0.03	0
NONHSAT193739.1	ENSG00000144674	5.965786602	2.576712373	4.4E-06	0.00011	yes	up	0.58	0.16	0.28	2.6	2.74	1.77	0.34	2.37
NONHSAT193792.1	ENSG00000230084	3.021025152	1.595038195	0.001	0.01223	yes	up	0.63	0.19	0.31	1.46	1.01	1.42	0.37667	1.29667
NONHSAT194109.1	ENSG00000242516	121.7241766	6.927471931	0.0035	0.03412	yes	up	0	0	0	0	0.09	0.04	0	0.04333
NONHSAT194648.1	ENSG00000240137	0.023386348	-5.41818963	0.00136	0.01586	yes	down	0.05	0.03	0.07	0	0	0	0.05	0
NONHSAT198728.1	ENSG00000138768	9.749899799	3.285387392	0.00364	0.03514	yes	up	0.28	0	0.01	1	1.5	0.81	0.09667	1.10333
NONHSAT199606.1	ENSG00000281591	2.310923448	1.208469469	0.00406	0.03827	yes	up	0.44	0.6	1.18	2.3	1.28	2.29	0.74	1.95667
NONHSAT200245.1	ENSG00000286242	0.344068445	-1.539232509	0.00184	0.02031	yes	down	0.9	0.67	0.29	0.19	0.27	0.27	0.62	0.24333
NONHSAT200775.1	ENSG00000232648	171.5461112	7.422452611	0.00121	0.0143	yes	up	0	0	0	0.08	0	0.09	0	0.05667
NONHSAT208282.1	ENSG00000287260	94.66779203	6.564801769	0.00197	0.02142	yes	up	0	0.03	0	0	2.17	0.49	0.01	0.88667
NONHSAT212945.1	ENSG00000186480	0.361988653	-1.465983618	0.00318	0.03158	yes	down	10.28	3.99	14.14	2.4	4.04	5.24	9.47	3.89333
NONHSAT215781.1	ENSG00000228801	119.380465	6.899422968	0.00364	0.0352	yes	up	0	0	0	0.19	0.12	0	0	0.10333
NONHSAT216072.1	ENSG00000286984	2.080442379	1.056890331	0.00388	0.03703	yes	up	0.11	0.17	0.2	0.32	0.44	0.38	0.16	0.38
NONHSAT216135.1	ENSG00000132561	0.267691701	-1.901355684	0.00147	0.01682	yes	down	2.16	1.65	1.03	0.24	0.83	0.43	1.61333	0.5
NONHSAT216908.1	ENSG00000254109	182.7533019	7.513753662	1E-07	3.6E-06	yes	up	0	0	0	0.21	0.08	0.08	0	0.12333
NONHSAT217026.1	ENSG00000023287	84.95072614	6.408554374	7E-05	0.00123	yes	up	0	0	0	0.25	0.62	0.15	0	0.34
NONHSAT219189.1	ENSG00000225706	0.028187945	-5.148777879	0.00357	0.03464	yes	down	0.06	0.02	0.02	0	0	0	0.03333	0
NONHSAT223026.1	ENSG00000232160	2.02154689	1.015459668	0.00403	0.03806	yes	up	0.25	0.17	0.32	0.48	0.64	0.59	0.24667	0.57
NONHSAT224738.1	ENSG00000204362	15.05086522	3.91177452	0.0022	0.02334	yes	up	0	0.04	0	0.32	0.2	0.11	0.01333	0.21
NONHSAT225578.1	ENSG00000237975	2.035929582	1.025687663	1.2E-05	0.00026	yes	up	0.39	0.41	0.46	1.02	0.91	1	0.42	0.97667
NONHSAT225651.1	ENSG00000272668	94.96994058	6.569399046	3.4E-06	8.4E-05	yes	up	0	0	0	0.04	0.03	0.05	0	0.04
NONHSAT227335.1	ENSG00000203739	0.027050277	-5.20821284	0.00387	0.03698	yes	down	0.18	0.04	0.09	0	0	0	0.10333	0
NONHSAT227914.1	ENSG00000225269	42.89149991	5.422619863	0.00309	0.03079	yes	up	0	0	0	0.01	0.05	0.05	0	0.03667
NONHSAT228910.1	ENSG00000254635	3.236306059	1.694348051	0.00437	0.04062	yes	up	0.07	0.02	0.15	0.38	0.17	0.32	0.08	0.29
NONHSAT229151.1	ENSG00000224596	2.164286577	1.113891542	0.00254	0.02626	yes	up	0.1	0.09	0.19	0.33	0.29	0.34	0.12667	0.32
NONHSAT229860.1	ENSG00000245532	0.009205047	-6.763359132	0.00445	0.04122	yes	down	0.04	0.05	0	0	0	0	0.03	0
NONHSAT230088.1	ENSG00000226645	117.7032953	6.879010901	0.00417	0.03914	yes	up	0	0	0	0.25	0	0.58	0	0.27667
NONHSAT230538.1	ENSG00000255557	2.40997992	1.269021126	0.0038	0.03649	yes	up	0.44	0.18	0.29	0.71	0.81	0.96	0.30333	0.82667
NONHSAT230609.1	ENSG00000248671	159.2466858	7.315119537	0.00163	0.01832	yes	up	0	0	0	0.53	0	0.27	0	0.26667
NONHSAT230637.1	ENSG00000215841	3.072744311	1.619527723	0.00333	0.03276	yes	up	0.04	0.07	0.06	0.15	0.23	0.2	0.05667	0.19333
NONHSAT230713.1	ENSG00000255250	107.136872	6.74331127	9.9E-06	0.00022	yes	up	0	0	0	0.17	0.5	0.2	0	0.29
NONHSAT231188.1	ENSG00000257261	2.047208797	1.033658252	1.3E-06	3.5E-05	yes	up	0.28	0.39	0.45	0.83	0.84	0.97	0.37333	0.88
NONHSAT231246.1	ENSG00000259887	2.706470732	1.436412787	0.00017	0.00272	yes	up	0.04	0.07	0.08	0.19	0.19	0.19	0.06333	0.19
NONHSAT231312.1	ENSG00000257354	3.43269861	1.779343195	0.00058	0.00771	yes	up	1.77	2.39	0.76	7.58	7.37	4.62	1.64	6.52333
NONHSAT231324.1	ENSG00000256268	2.068164065	1.048350637	0.00016	0.00249	yes	up	0.08	0.06	0.1	0.23	0.18	0.17	0.08	0.19333
NONHSAT232890.1	ENSG00000215417	0.472427404	-1.081835442	0.00095	0.01177	yes	down	0.27	0.34	0.16	0.12	0.12	0.18	0.25667	0.14
NONHSAT233171.1	ENSG00000271216	0.011956571	-6.386052468	4.1E-05	0.00076	yes	down	0.08	0.15	0.05	0	0	0	0.09333	0
NONHSAT233307.1	ENSG00000261105	0.228283354	-2.131102429	0.00026	0.00387	yes	down	0.08	0.08	0.07	0.03	0.01	0.03	0.07667	0.02333
NONHSAT233546.1	ENSG00000258457	4.611545751	2.205250411	0.00139	0.01606	yes	up	0.28	0.25	0.02	1.14	1.02	0.84	0.18333	1
NONHSAT233701.1	ENSG00000237356	152.869183	7.256153792	1.2E-07	4.1E-06	yes	up	0	0	0	0.18	0.2	0.09	0	0.15667
NONHSAT233705.1	ENSG00000237356	0.009008511	-6.794495569	1.5E-05	0.00032	yes	down	0.03	0.15	0.13	0	0	0	0.10333	0
NONHSAT234256.1	ENSG00000100528	553.4159969	9.112220537	9.2E-08	3.3E-06	yes	up	0	0	0	1.22	0.04	1.59	0	0.95
NONHSAT235044.1	ENSG00000285667	2.431070444	1.281591698	0.00424	0.03967	yes	up	0.25	0.3	0.18	0.77	0.58	0.73	0.24333	0.69333
NONHSAT235474.1	ENSG00000275527	0.006464094	-7.273336099	0.00016	0.00258	yes	down	0.01	0.23	0.23	0	0	0	0.15667	0
NONHSAT235679.1	ENSG00000247809	2.286397091	1.193075986	0.00363	0.03509	yes	up	0.02	0.02	0.05	0.09	0.09	0.07	0.03	0.08333
NONHSAT236426.1	ENSG00000259925	0.011016754	-6.504157016	3.1E-05	0.00059	yes	down	0.08	0.02	0.04	0	0	0	0.04667	0
NONHSAT236849.1	ENSG00000270124	0.009008907	-6.794432182	0.00431	0.04012	yes	down	0.04	0	0.02	0	0	0	0.02	0
NONHSAT237330.1	ENSG00000265148	0.064105542	-3.963407112	0.00051	0.00692	yes	down	0.12	0.16	0.17	0	0	0.03	0.15	0.01
NONHSAT237333.1	ENSG00000265148	110.658463	6.78996998	0.00468	0.0428	yes	up	0	0	0	0	0.2	0.08	0	0.09333
NONHSAT237464.1	ENSG00000256124	78.28543769	6.290672064	0.00024	0.00365	yes	up	0	0	0	0.11	0.02	0.05	0	0.06

NONHSAT238003.1	ENSG00000263766	0.009450247	-6.72543224	0.00469	0.04285	yes	down	0.1	0.09	0	0	0	0	0.06333	0
NONHSAT238252.1	ENSG00000185168	3.605269825	1.850107237	0.00098	0.01201	yes	up	0.11	0.07	0.1	0.19	0.54	0.42	0.09333	0.38333
NONHSAT238261.1	ENSG00000262877	2.313219054	1.209901891	0.00197	0.02144	yes	up	0.11	0.17	0.28	0.54	0.47	0.47	0.18667	0.49333
NONHSAT239059.1	ENSG00000226800	124.457923	6.959514266	6.2E-07	1.8E-05	yes	up	0	0	0	0.07	0.03	0.07	0	0.05667
NONHSAT239193.1	ENSG00000282851	0.015118081	-6.047581204	7.1E-05	0.00125	yes	down	0.1	0.05	0.06	0	0	0	0.07	0
NONHSAT239335.1	ENSG00000233527	0.007331842	-7.091608625	0.00285	0.02884	yes	down	0	0.09	0.04	0	0	0	0.04333	0
NONHSAT239403.1	ENSG00000213904	44.63564072	5.48012423	0.00151	0.01725	yes	up	0	0	0	0.15	0.08	0.05	0	0.09333
NONHSAT239464.1	ENSG00000286024	0.026864041	-5.218179854	0.00243	0.0253	yes	down	0.07	0.03	0.03	0	0	0	0.04333	0
NONHSAT239591.1	ENSG00000268895	2.203771751	1.139974809	0.00426	0.03987	yes	up	0.24	0.2	0.23	0.55	0.72	0.41	0.22333	0.56
NONHSAT239845.1	ENSG00000268119	0.006006649	-7.379223946	0.00126	0.01486	yes	down	0.09	0.11	0	0	0	0	0.06667	0
NONHSAT239958.1	ENSG00000271109	0.022319915	-5.485524669	0.00047	0.00645	yes	down	0.29	0.29	0.28	0	0	0	0.28667	0
NONHSAT240760.1	ENSG00000286045	0.006444033	-7.277820493	0.00214	0.02287	yes	down	0.77	0.19	0	0	0	0	0.32	0
NONHSAT240792.1	ENSG00000232504	158.3528528	7.30699048	1.5E-07	5E-06	yes	up	0	0	0	0.14	0.09	0.05	0	0.09333
NONHSAT240922.1	ENSG00000226508	17.47741538	4.127419945	0.00236	0.02473	yes	up	0	0	0.02	0.21	0.07	0.07	0.00667	0.11667
NONHSAT241672.1	ENSG00000235092	107.0337582	6.741922081	0.00461	0.04236	yes	up	0	0	0	0	0.1	0.16	0	0.08667
NONHSAT241923.1	ENSG00000259439	14.79533363	3.887070324	0.00148	0.01696	yes	up	0	0	0.06	0.37	0.22	0.3	0.02	0.29667
NONHSAT242091.1	ENSG00000226819	0.00490735	-7.670840097	2E-09	1E-07	yes	down	0.08	0.06	0.08	0	0	0	0.07333	0
NONHSAT242149.1	ENSG00000179818	0.01067139	-6.550108082	4.3E-06	0.0001	yes	down	0.13	0.18	0.23	0	0	0	0.18	0
NONHSAT242460.1	ENSG00000270019	0.007110442	-7.135845135	1.7E-07	5.9E-06	yes	down	0.05	0.08	0.11	0	0	0	0.08	0
NONHSAT243203.1	ENSG00000230506	3.130015936	1.646170002	0.00162	0.01824	yes	up	0.03	0.03	0.02	0.14	0.08	0.08	0.02667	0.1
NONHSAT243455.1	ENSG00000203999	0.004698661	-7.733534492	1.9E-07	6.5E-06	yes	down	0.08	0.16	0.03	0	0	0	0.09	0
NONHSAT243602.1	ENSG00000225377	0.008807288	-6.827086493	0.00418	0.03917	yes	down	0	0.07	0.1	0	0	0	0.05667	0
NONHSAT243610.1	ENSG00000225377	0.0084563	-6.88575773	0.00344	0.03367	yes	down	0.07	0	0.1	0	0	0	0.05667	0
NONHSAT243629.1	ENSG00000286288	2.286932684	1.1934139	0.00021	0.00323	yes	up	0.04	0.04	0.04	0.13	0.1	0.09	0.04	0.10667
NONHSAT244641.1	ENSG00000230061	2.082986514	1.058653499	0.00227	0.0239	yes	up	0.1	0.14	0.14	0.3	0.18	0.43	0.12667	0.30333
NONHSAT245224.1	ENSG00000231993	2.504652116	1.324610234	0.00515	0.04625	yes	up	0.05	0.05	0.06	0.17	0.1	0.18	0.05333	0.15
NONHSAT246087.1	ENSG00000272970	133.880924	7.064806603	2.7E-07	8.7E-06	yes	up	0	0	0	0.12	0.06	0.12	0	0.1
NONHSAT246239.1	ENSG00000206573	0.006597768	-7.243806151	0.00168	0.01872	yes	down	0.08	0.07	0	0	0	0	0.05	0
NONHSAT246539.1	ENSG00000241472	10.8356721	3.437716737	9.2E-05	0.00156	yes	up	0.02	0	0.03	0.26	0.22	0.1	0.01667	0.19333
NONHSAT246955.1	ENSG00000240875	2.871961171	1.522036244	0.00566	0.04989	yes	up	0.06	0.04	0.05	0.24	0.12	0.14	0.05	0.16667
NONHSAT247507.1	ENSG00000248866	37.04345612	5.211146802	0.00045	0.00626	yes	up	0.01	0.01	0	0.55	0.01	0.23	0.00667	0.26333
NONHSAT247904.1	ENSG00000249675	3.956411737	1.984192573	0.00461	0.04231	yes	up	0.1	0.05	0.07	0.52	0.08	0.42	0.07333	0.34
NONHSAT249286.1	ENSG00000250320	79.6458017	6.315526411	2.4E-05	0.00047	yes	up	0	0	0	0.16	0.13	0.28	0	0.19
NONHSAT249290.1	ENSG00000250320	0.321343123	-1.637813496	0.00216	0.02297	yes	down	0.25	0.54	0.43	0.12	0.21	0.13	0.40667	0.15333
NONHSAT249568.1	ENSG00000236714	0.006248066	-7.322374496	0.00152	0.01732	yes	down	0	0.06	0.06	0	0	0	0.04	0
NONHSAT249575.1	ENSG00000236714	169.8227814	7.407886196	0.00307	0.03062	yes	up	0	0	0	0	0.01	0.13	0	0.04667
NONHSAT249579.1	ENSG00000236714	76.96618082	6.266152755	2.6E-10	1.5E-08	yes	up	0	0	0	0.14	0.15	0.07	0	0.12
NONHSAT249965.1	ENSG00000271874	97.19279718	6.602777497	0.00017	0.00265	yes	up	0	0	0	0.11	0.02	0.19	0	0.10667
NONHSAT250866.1	ENSG00000272269	0.280629296	-1.833262471	0.0011	0.01324	yes	down	0.51	0.26	0.4	0.12	0.1	0.16	0.39	0.12667
NONHSAT252478.1	ENSG00000231776	55.59101462	5.796779809	0.00354	0.03441	yes	up	0	0	0	0	0.04	0.02	0	0.02
NONHSAT252787.1	ENSG00000233452	101.5435556	6.665954873	5E-07	1.5E-05	yes	up	0	0	0	0.13	0.21	0.27	0	0.20333
NONHSAT253164.1	ENSG00000232949	4.620723302	2.208118701	1.1E-06	3.1E-05	yes	up	0.04	0.11	0.07	0.41	0.3	0.46	0.07333	0.39
NONHSAT253388.1	ENSG00000223475	0.025972887	-5.266849809	0.00455	0.04192	yes	down	0.08	0.03	0	0	0	0	0.03667	0
NONHSAT253802.1	ENSG00000273344	0.00852735	-6.873686892	4E-07	1.3E-05	yes	down	0.15	0.16	0.11	0	0	0	0.14	0
NONHSAT253927.1	ENSG00000234141	0.023818552	-5.391770505	0.00143	0.01644	yes	down	0.03	0.07	0.04	0	0	0	0.04667	0
NONHSAT254537.1	ENSG00000285106	0.303458954	-1.720426703	1.8E-08	7.6E-07	yes	down	1.93	2.88	1.88	0.76	0.62	0.96	2.23	0.78
NONHSAT254980.1	ENSG00000247134	3.32905755	1.735113811	0.00395	0.03757	yes	up	0.9	0.56	0.37	1.58	2.27	2.96	0.61	2.27
NONHSAT255047.1	ENSG00000286878	43.44093943	5.440983397	0.00085	0.01061	yes	up	0	0	0	0.02	0.03	0.03	0	0.02667
NONHSAT255521.1	ENSG00000253931	55.21905159	5.787094204	0.00017	0.00266	yes	up	0	0	0	0.06	0.07	0.04	0	0.05667
NONHSAT255576.1	ENSG00000255559	49.1685731	5.619664583	0.00053	0.00716	yes	up	0	0	0	0.1	0.09	0.18	0	0.12333
NONHSAT255790.1	ENSG00000246339	62.73450748	5.971187319	0.0005	0.00683	yes	up	0	0	0	0.24	0.07	0.06	0	0.12333
NONHSAT256271.1	ENSG00000249375	42.08578501	5.395261123	0.00149	0.01704	yes	up	0	0	0	0.04	0.04	0.02	0	0.03333
NONHSAT256593.1	ENSG00000281128	110.7387624	6.791016493	0.00467	0.04277	yes	up	0	0	0	0	0.03	0.07	0	0.03333
NONHSAT256625.1	ENSG00000281649	0.035553032	-4.813883586	1.1E-05	0.00025	yes	down	0.34	0.17	0.14	0	0	0.02	0.21667	0.00667
NONHSAT256930.1	ENSG00000232283	116.9582981	6.869850414	0.00377	0.03623	yes	up	0	0	0	0.1	0.08	0	0	0.06
NONHSAT257109.1	ENSG00000223478	36.03784189	5.171440713	0.00456	0.04199	yes	up	0	0	0	0.15	0.07	0.31	0	0.17667
NONHSAT257356.1	ENSG00000171889	4.516164546	2.175098052	2.4E-25	7.5E-23	yes	up	0.42	0.45	0.31	2.47	2.02	1.63	0.39333	2.04
NONHSAT257741.1	ENSG00000230030	0.004100137	-7.930112322	6.3E-11	4.1E-09	yes	down	0.14	0.13	0.13	0	0	0	0.13333	0
NONHSAT257742.1	ENSG00000230030	33.54603354	5.068070288	1.2E-09	6.2E-08	yes	up	0	0.01	0	0.24	0.21	0.18	0.00333	0.21
NONHSAT258028.1	ENSG00000236017	61.11945067	5.933559672	7.9E-05	0.00137	yes	up	0	0	0	0.04	0.03	0.04	0	0.03667
NONHSAT258134.1	ENSG00000267064	0.04868287	-4.360441964	0.00105	0.01278	yes	down	0.07	0.07	0.04	0	0.01	0	0.06	0.00333



NONHSAT258180.1	ENSG00000227486	0.018066236	-5.790560203	0.00334	0.03284	yes	down	0.1	0	0.08	0	0	0	0.06	0
NONHSAT258465.1	ENSG00000266560	2.551195189	1.351173282	2.5E-07	8E-06	yes	up	0.12	0.13	0.17	0.36	0.42	0.41	0.14	0.39667
NONHSAT258467.1	ENSG00000266560	3.412589766	1.770866996	0.00182	0.02007	yes	up	0.02	0.06	0.04	0.13	0.18	0.13	0.04	0.14667
NONHSAT258657.1	ENSG00000204904	89.57028533	6.484948297	3.4E-06	8.5E-05	yes	up	0	0	0	0.29	0.27	0.26	0	0.27333
NR_046112.1	ENSG00000204588	68.5301143	6.098666188	3.2E-05	0.00061	yes	up	0	0	0	0.17	0.15	0.19	0	0.17
NR_152799.1	ENSG00000245937	0.001250998	-9.642705303	5E-13	4.3E-11	yes	down	1.01	0.23	0.8	0	0	0	0.68	0
NR_164126.1	ENSG00000278915	2.26733174	1.180995491	0.00481	0.04378	yes	up	0.14	0.08	0.14	0.27	0.39	0.28	0.12	0.31333
XR_001738234.1	ENSG00000229021	0.006180584	-7.338041208	0.00147	0.01686	yes	down	0	0.17	0.2	0	0	0	0.12333	0
XR_001739127.1	ENSG00000230065	0.029406753	-5.087708698	0.00098	0.012	yes	down	0.02	0.03	0.06	0	0	0	0.03667	0
XR_001739144.1	ENSG00000287129	2.233729914	1.159454757	0.00164	0.01837	yes	up	0.1	0.07	0.16	0.28	0.28	0.28	0.11	0.28
XR_001742733.2	ENSG00000285804	135.1827822	7.078767601	0.00257	0.02654	yes	up	0	0	0	0.26	0	0.15	0	0.13667
XR_001742740.2	ENSG00000285804	0.012837733	-6.283465776	0.00067	0.00876	yes	down	0.17	0.04	0.01	0	0	0	0.07333	0
XR_001744064.1	ENSG00000285571	114.8663108	6.843811921	0.00459	0.04218	yes	up	0	0	0	0.11	0	0.04	0	0.05
XR_001752115.1	ENSG00000260219	0.024478266	-5.352354828	0.00021	0.00323	yes	down	0.1	0.05	0.05	0.01	0	0	0.06667	0.00333
XR_001752822.1	ENSG00000238007	2.107333437	1.075418606	0.00399	0.0378	yes	up	0.11	0.09	0.09	0.23	0.19	0.26	0.09667	0.22667
XR_001754470.2	ENSG00000276649	2.118760661	1.083220627	3E-05	0.00058	yes	up	0.37	0.2	0.21	0.59	0.61	0.7	0.26	0.63333
XR_001755027.1	ENSG00000231324	3.194320445	1.675509047	0.00014	0.00233	yes	up	0.41	0.15	0.35	1.35	0.86	1.1	0.30333	1.10333
XR_001755114.2	ENSG00000280145	3.417305032	1.77285903	6.6E-06	0.00015	yes	up	0.38	0.41	1.08	2.44	2.5	2.36	0.62333	2.43333
XR_923345.2	ENSG00000230065	120.7138952	6.915447942	4.7E-07	1.4E-05	yes	up	0	0	0	0.09	0.08	0.05	0	0.07333
XR_926624.3	ENSG00000285571	118.560275	6.889476889	0.00408	0.03841	yes	up	0	0	0	0.13	0	0.05	0	0.06
XR_928874.3	ENSG00000228801	0.008891814	-6.81330658	6.3E-07	1.9E-05	yes	down	0.07	0.09	0.12	0	0	0	0.09333	0
XR_929040.2	ENSG00000253317	2.129953248	1.090821764	0.00262	0.02697	yes	up	0.16	0.14	0.21	0.38	0.48	0.39	0.17	0.41667
XR_931178.2	ENSG00000286626	0.014127013	-6.145399751	5E-05	0.0009	yes	down	0.2	0.27	0.11	0	0	0	0.19333	0
XR_934818.3	ENSG00000244649	0.059669972	-4.066851102	0.00193	0.02108	yes	down	0.65	0.5	0.19	0	0.09	0	0.44667	0.03
XR_936418.3	ENSG00000268119	156.8335821	7.2930907	0.00158	0.01784	yes	up	0	0	0	0.11	0.11	0	0	0.07333
XR_950885.2	ENSG00000259925	2.076287417	1.054006168	0.00095	0.01176	yes	up	0.06	0.07	0.07	0.17	0.17	0.14	0.06667	0.16

Table S5: Top 10 upregulated and 10 downregulated lncRNA transcripts.

LncRNA ID	Log <sub>2</sub> FC(PC/Con)	Regulate
NONHSAT054508.2	10.44	Up
ENST00000654005	9.14	Up
NONHSAT234256.1	9.11	Up
NONHSAT104167.2	8.76	Up
NONHSAT135554.2	8.18	Up
NONHSAT216908.1	7.51	Up
ENST00000670471	7.5	Up
NONHSAT200775.1	7.42	Up
NONHSAT249575.1	7.4	Up
ENST00000660542	7.4	Up
ENST00000538717	-10.01	Down
NR_152799.1	-9.64	Down
NONHSAT183309.1	-8.34	Down
ENST00000488584	-8.14	Down
ENST00000657910	-8.13	Down
NONHSAT257741.1	-7.93	Down
NONHSAT243455.1	-7.73	Down
NONHSAT242091.1	-7.67	Down
NONHSAT031960.2	-7.49	Down
NONHSAT239845.1	-7.37	Down

The DE lncRNA s were shown to be enriched in signaling pathways related to cell growth and metabolism, such as the NOD-like receptor signaling pathway (map04621) and apoptosis (map04215). Strikingly, the DE lncRNA s were enriched in pathways associated with cancer (map05200) and small cell lung cancer (map05222) according to the KEGG analysis, suggesting that the DE lncRNA s affected the growth, apoptosis, and viability of A549 lung cancer cells, which were possibly regulated by phycocyanin.

The potential target genes of DE lncRNA s were predicted by a trans-regulation analysis method to determine the functions of this

core lncRNA s. A total of 207 Trans targets (p-adjust < 0.01) for DE lncRNA s were screened and obtained. Detailed information on the potential targets of lncRNA s is shown in Table S6. Next, the target genes were annotated by GO enrichment analysis. In total, 780 GO entries were obtained, and Figure 2C presents the top 20 GO entries. It is worth noting that the DE lncRNA s were enriched in several GO items related to cell movement and proliferation were enriched, including GO: 0007166 (cell surface receptor signaling pathway), GO: 0006928 (movement of cell or subcellular component), GO: 0006955 (immune response), and GO: 0070613 (regulation of protein processing). Moreover, the Notch signaling pathway (GO: 0007219) was predicted to be activated in A549 cells after phycocyanin treatment.

In this work, 193 upregulated and 116 downregulated lncRNA s were identified between phycocyanin-treated and control A549 cells. In addition, the target genes (mRNAs) of DE lncRNA s were identified in PC samples, indicating that the expression of various genes was altered by lncRNA s after phycocyanin treatment. Currently, it has been reported that lncRNA s could be potential biomarkers for multiple cancers, including NSCLC [18,19]; however, the involved regulatory mechanism is not yet clearly understood. In this work, according to the GO enrichment analysis, the biological factors affected most by phycocyanin are extracellular region, extracellular space, and epithelium development, which suggested that NSCLC cell behavior is likely regulated by phycocyanin through lncRNA s and target genes. In addition, KEGG analysis of lncRNA s showed that the NOD-like receptor pathway, Notch pathway, and apoptosis were also enriched after phycocyanin exposure in A549 cells. Alzokaky et al. reported that phycocyanin could protect against ethanol-induced gastric ulcers in rats through multiple signaling pathways, including the HMGB1/NLRP3/NF-κB and NOD-like receptor pathways [20]. It's worth mentioning that we used mRNA-seq to study the potential mechanism of phycocyanin, which also showed that "apoptosis pathway" and "NOD-like receptor pathway" were significantly enriched after

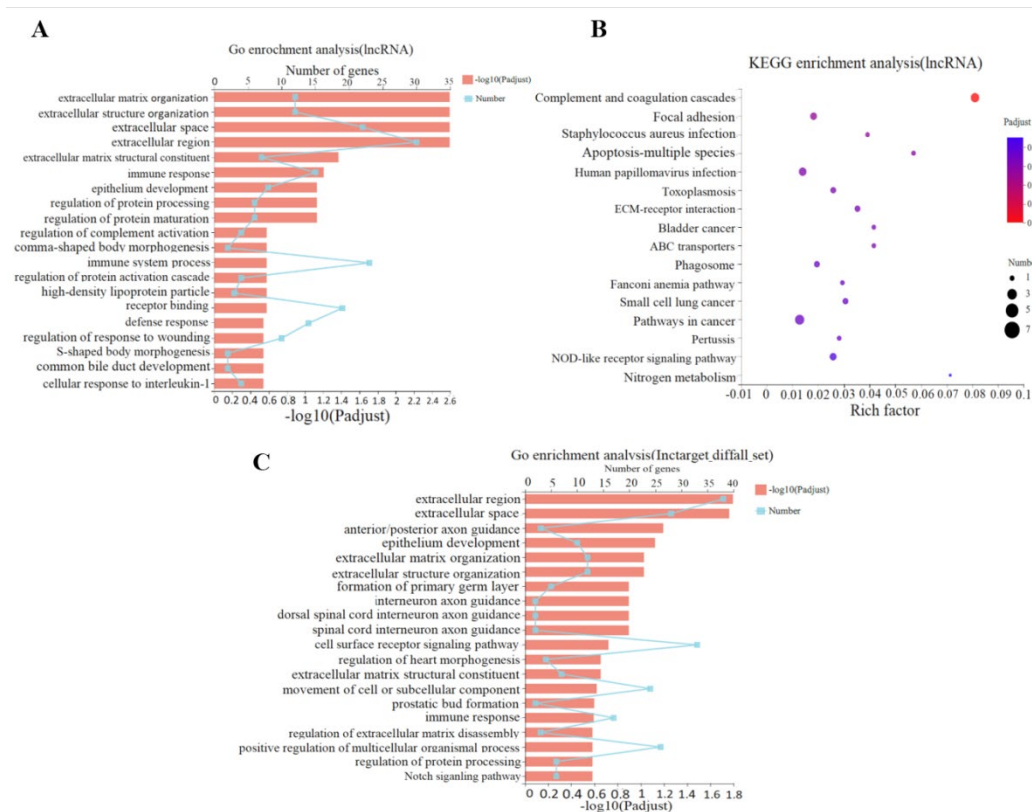


Figure 2: The GO (A) and KEGG (B) enrichment analysis of DE lncRNAs. (C) The GO enrichment analysis of targets of DE lncRNAs.

Table S6: Detailed information for potential targets of DE lncRNAs.

lncRNA id	lncRNA gene id	Type	Target gene id	Target gene name	Gene description
ENST00000562992	ENSG00000260693	known	ENSG00000129226	CD68	CD68 molecule [Source:HGNC Symbol;Acc:HGNC:1693]
ENST00000562992	ENSG00000260693	known	ENSG00000197249	SERPINA1	serpin family A member 1 [Source:HGNC Symbol;Acc:HGNC:8941]
NONHSAT096667.2	ENSG00000248479	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
NONHSAT096667.2	ENSG00000248479	known	ENSG00000203724	C1orf53	chromosome 1 open reading frame 53 [Source:HGNC Symbol;Acc:HGNC:30003]
NONHSAT096667.2	ENSG00000248479	known	ENSG00000166922	SCG5	secretogranin V [Source:HGNC Symbol;Acc:HGNC:10816]
NONHSAT216135.1	ENSG00000132561	known	ENSG00000123843	C4BPB	complement component 4 binding protein beta [Source:HGNC Symbol;Acc:HGNC:1328]
ENST00000432735	ENSG00000215424	known	ENSG00000197774	EME2	essential meiotic structure-specific endonuclease subunit 2 [Source:HGNC Symbol;Acc:HGNC:27289]
ENST00000606771	ENSG00000272269	known	ENSG00000162366	PDZK1IP1	PDZK1 interacting protein 1 [Source:HGNC Symbol;Acc:HGNC:16887]
ENST00000606771	ENSG00000272269	known	ENSG00000167549	CORO6	coronin 6 [Source:HGNC Symbol;Acc:HGNC:21356]
ENST00000606771	ENSG00000272269	known	ENSG00000165029	ABCA1	ATP binding cassette subfamily A member 1 [Source:HGNC Symbol;Acc:HGNC:29]
ENST00000606771	ENSG00000272269	known	ENSG0000023445	BIRC3	baculoviral IAP repeat containing 3 [Source:HGNC Symbol;Acc:HGNC:591]
ENST00000606771	ENSG00000272269	known	ENSG00000134339	SAA2	serum amyloid A2 [Source:HGNC Symbol;Acc:HGNC:10514]
NONHSAT123250.2	ENSG00000128595	known	ENSG00000197774	EME2	essential meiotic structure-specific endonuclease subunit 2 [Source:HGNC Symbol;Acc:HGNC:27289]
NONHSAT123250.2	ENSG00000128595	known	ENSG00000181444	ZNF467	zinc finger protein 467 [Source:HGNC Symbol;Acc:HGNC:23154]
ENST00000432735	ENSG00000215424	known	ENSG00000114315	HES1	hes family bHLH transcription factor 1 [Source:HGNC Symbol;Acc:HGNC:5192]
ENST00000432735	ENSG00000215424	known	ENSG00000125398	SOX9	SRY-box transcription factor 9 [Source:HGNC Symbol;Acc:HGNC:11204]
ENST00000432735	ENSG00000215424	known	ENSG00000181444	ZNF467	zinc finger protein 467 [Source:HGNC Symbol;Acc:HGNC:23154]
NONHSAT096667.2	ENSG00000248479	known	ENSG00000163131	CTSS	cathepsin S [Source:HGNC Symbol;Acc:HGNC:2545]
NONHSAT216135.1	ENSG00000132561	known	ENSG00000148677	ANKRD1	ankyrin repeat domain 1 [Source:HGNC Symbol;Acc:HGNC:15819]
NONHSAT147157.2	ENSG00000232712	known	MSTRG.5468		
NONHSAT147157.2	ENSG00000232712	known	ENSG00000130827	PLXNA3	plexin A3 [Source:HGNC Symbol;Acc:HGNC:9101]
NONHSAT147157.2	ENSG00000232712	known	ENSG00000269028	MTRNR2L12	MT-RNR2 like 12 [Source:HGNC Symbol;Acc:HGNC:37169]
ENST00000656756	ENSG00000259583	known	ENSG00000148677	ANKRD1	ankyrin repeat domain 1 [Source:HGNC Symbol;Acc:HGNC:15819]

ENST00000656756	ENSG00000259583	known	ENSG00000123843	C4BPB	complement component 4 binding protein beta [Source:HGNC Symbol;Acc:HGNC:1328]
NONHSAT147157.2	ENSG00000232712	known	ENSG00000100027	YPEL1	yippee like 1 [Source:HGNC Symbol;Acc:HGNC:12845]
NONHSAT147157.2	ENSG00000232712	known	ENSG00000137965	IFI44	interferon induced protein 44 [Source:HGNC Symbol;Acc:HGNC:16938]
ENST00000656756	ENSG00000259583	known	ENSG00000104368	PLAT	plasminogen activator, tissue type [Source:HGNC Symbol;Acc:HGNC:9051]
ENST00000656756	ENSG00000259583	known	ENSG00000172602	RND1	Rho family GTPase 1 [Source:HGNC Symbol;Acc:HGNC:18314]
NONHSAT225578.1	ENSG00000237975	known	ENSG00000104368	PLAT	plasminogen activator, tissue type [Source:HGNC Symbol;Acc:HGNC:9051]
NONHSAT225578.1	ENSG00000237975	known	ENSG00000172602	RND1	Rho family GTPase 1 [Source:HGNC Symbol;Acc:HGNC:18314]
NONHSAT003731.2	ENSG00000162433	known	ENSG00000137965	IFI44	interferon induced protein 44 [Source:HGNC Symbol;Acc:HGNC:16938]
NONHSAT003731.2	ENSG00000162433	known	ENSG00000130827	PLXNA3	plexin A3 [Source:HGNC Symbol;Acc:HGNC:9101]
NONHSAT003731.2	ENSG00000162433	known	ENSG00000269028	MTRNR2L12	MT-RNR2 like 12 [Source:HGNC Symbol;Acc:HGNC:37169]
NONHSAT225578.1	ENSG00000237975	known	ENSG00000148677	ANKRD1	ankyrin repeat domain 1 [Source:HGNC Symbol;Acc:HGNC:15819]
NONHSAT003731.2	ENSG00000162433	known	ENSG00000100027	YPEL1	yippee like 1 [Source:HGNC Symbol;Acc:HGNC:12845]
NONHSAT225578.1	ENSG00000237975	known	ENSG00000123843	C4BPB	complement component 4 binding protein beta [Source:HGNC Symbol;Acc:HGNC:1328]
NONHSAT254537.1	ENSG00000285106	known	ENSG00000114315	HES1	hes family bHLH transcription factor 1 [Source:HGNC Symbol;Acc:HGNC:5192]
NONHSAT254537.1	ENSG00000285106	known	ENSG00000125398	SOX9	SRY-box transcription factor 9 [Source:HGNC Symbol;Acc:HGNC:11204]
NONHSAT254537.1	ENSG00000285106	known	ENSG00000181444	ZNF467	zinc finger protein 467 [Source:HGNC Symbol;Acc:HGNC:23154]
NONHSAT159591.1	ENSG00000023445	known	ENSG00000162366	PDZK1IP1	PDZK1 interacting protein 1 [Source:HGNC Symbol;Acc:HGNC:16887]
NONHSAT216135.1	ENSG00000132561	known	ENSG00000104368	PLAT	plasminogen activator, tissue type [Source:HGNC Symbol;Acc:HGNC:9051]
NONHSAT216135.1	ENSG00000132561	known	ENSG00000172602	RND1	Rho family GTPase 1 [Source:HGNC Symbol;Acc:HGNC:18314]
NONHSAT159591.1	ENSG00000023445	known	ENSG00000167549	CORO6	coronin 6 [Source:HGNC Symbol;Acc:HGNC:21356]
NONHSAT159591.1	ENSG00000023445	known	ENSG00000165029	ABCA1	ATP binding cassette subfamily A member 1 [Source:HGNC Symbol;Acc:HGNC:29]
NONHSAT159591.1	ENSG00000023445	known	ENSG00000134339	SAA2	serum amyloid A2 [Source:HGNC Symbol;Acc:HGNC:10514]
NONHSAT186058.1	ENSG00000224063	known	ENSG00000160886	LY6K	lymphocyte antigen 6 family member K [Source:HGNC Symbol;Acc:HGNC:24225]
NONHSAT186058.1	ENSG00000224063	known	ENSG00000167244	IGF2	insulin like growth factor 2 [Source:HGNC Symbol;Acc:HGNC:5466]
NONHSAT186058.1	ENSG00000224063	known	ENSG00000243649	CFB	complement factor B [Source:HGNC Symbol;Acc:HGNC:1037]
NONHSAT254537.1	ENSG00000285106	known	ENSG00000197774	EME2	essential meiotic structure-specific endonuclease subunit 2 [Source:HGNC Symbol;Acc:HGNC:27289]
ENST00000628917	ENSG00000242086	known	ENSG00000145920	CPLX2	complexin 2 [Source:HGNC Symbol;Acc:HGNC:2310]
ENST00000435356	ENSG00000203392	known	ENSG00000125895	TMEM74B	transmembrane protein 74B [Source:HGNC Symbol;Acc:HGNC:15893]
ENST00000435356	ENSG00000203392	known	MSTRG.5832		
ENST00000435356	ENSG00000203392	known	ENSG00000117594	HSD11B1	hydroxysteroid 11-beta dehydrogenase 1 [Source:HGNC Symbol;Acc:HGNC:5208]
ENST00000435356	ENSG00000203392	known	ENSG00000173432	SAA1	serum amyloid A1 [Source:HGNC Symbol;Acc:HGNC:10513]
ENST00000628917	ENSG00000242086	known	ENSG00000176692	FOXC2	forkhead box C2 [Source:HGNC Symbol;Acc:HGNC:3801]
ENST00000628917	ENSG00000242086	known	ENSG00000173531	MST1	macrophage stimulating 1 [Source:HGNC Symbol;Acc:HGNC:7380]
NONHSAT146423.2	ENSG00000265185	known	ENSG00000168676	KCTD19	potassium channel tetramerization domain containing 19 [Source:HGNC Symbol;Acc:HGNC:24753]
NONHSAT146423.2	ENSG00000265185	known	ENSG00000008517	IL32	interleukin 32 [Source:HGNC Symbol;Acc:HGNC:16830]
ENST00000667654	ENSG00000274265	known	ENSG00000131409	LRRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
ENST00000667654	ENSG00000274265	known	ENSG00000107821	KAZALD1	Kazal type serine peptidase inhibitor domain 1 [Source:HGNC Symbol;Acc:HGNC:25460]
NONHSAT146423.2	ENSG00000265185	known	ENSG00000078098	FAP	fibroblast activation protein alpha [Source:HGNC Symbol;Acc:HGNC:3590]
ENST00000651958	ENSG00000280441	known	ENSG00000149809	TM7SF2	transmembrane 7 superfamily member 2 [Source:HGNC Symbol;Acc:HGNC:11863]
NONHSAT146423.2	ENSG00000265185	known	ENSG00000101198	NKAIN4	sodium/potassium transporting ATPase interacting 4 [Source:HGNC Symbol;Acc:HGNC:16191]
NONHSAT015626.2	ENSG00000180628	known	ENSG00000166922	SCG5	secretogranin V [Source:HGNC Symbol;Acc:HGNC:10816]
NONHSAT015626.2	ENSG00000180628	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
NONHSAT015626.2	ENSG00000180628	known	ENSG00000203724	C1orf53	chromosome 1 open reading frame 53 [Source:HGNC Symbol;Acc:HGNC:30003]
ENST00000658813	ENSG00000223546	known	ENSG00000166922	SCG5	secretogranin V [Source:HGNC Symbol;Acc:HGNC:10816]
NONHSAT015626.2	ENSG00000180628	known	ENSG00000163131	CTSS	cathepsin S [Source:HGNC Symbol;Acc:HGNC:2545]
ENST00000658813	ENSG00000223546	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
ENST00000658813	ENSG00000223546	known	ENSG00000203724	C1orf53	chromosome 1 open reading frame 53 [Source:HGNC Symbol;Acc:HGNC:30003]
ENST00000534918	ENSG00000225138	known	ENSG00000125895	TMEM74B	transmembrane protein 74B [Source:HGNC Symbol;Acc:HGNC:15893]
NONHSAT198728.1	ENSG00000138768	known	ENSG00000050805	LAMC2	laminin subunit gamma 2 [Source:HGNC Symbol;Acc:HGNC:6493]
NONHSAT198728.1	ENSG00000138768	known	ENSG00000196611	MMP1	matrix metalloproteinase 1 [Source:HGNC Symbol;Acc:HGNC:7155]

NONHSAT198728.1	ENSG00000138768	known	ENSG00000172638	EFEMP2	EGF containing fibulin extracellular matrix protein 2 [Source:HGNC Symbol;Acc:HGNC:3219]
NONHSAT183309.1	ENSG00000235852	known	ENSG00000085831	TTC39A	tetratricopeptide repeat domain 39A [Source:HGNC Symbol;Acc:HGNC:18657]
NONHSAT183309.1	ENSG00000235852	known	ENSG00000276600	RAB7B	RAB7B, member RAS oncogene family [Source:HGNC Symbol;Acc:HGNC:30513]
ENST00000534918	ENSG00000225138	known	ENSG00000117594	HSD11B1	hydroxysteroid 11-beta dehydrogenase 1 [Source:HGNC Symbol;Acc:HGNC:5208]
ENST00000534918	ENSG00000225138	known	ENSG00000173432	SAA1	serum amyloid A1 [Source:HGNC Symbol;Acc:HGNC:10513]
ENST00000534918	ENSG00000225138	known	MSTRG.5832		
NONHSAT198728.1	ENSG00000138768	known	ENSG00000131409	LRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
NONHSAT198728.1	ENSG00000138768	known	ENSG00000107821	KAZALD1	Kazal type serine peptidase inhibitor domain 1 [Source:HGNC Symbol;Acc:HGNC:25460]
ENST00000667654	ENSG00000274265	known	ENSG00000196611	MMP1	matrix metalloproteinase 1 [Source:HGNC Symbol;Acc:HGNC:7155]
NONHSAT181266.1	ENSG00000162976	known	ENSG00000107159	CA9	carbonic anhydrase 9 [Source:HGNC Symbol;Acc:HGNC:1383]
NONHSAT181266.1	ENSG00000162976	known	ENSG00000265972	TXNIP	thioredoxin interacting protein [Source:HGNC Symbol;Acc:HGNC:16952]
NONHSAT181266.1	ENSG00000162976	known	ENSG00000179111	HES7	hes family bHLH transcription factor 7 [Source:HGNC Symbol;Acc:HGNC:15977]
NONHSAT000917.2	ENSG00000177000	known	ENSG00000255823	MTRNR2L8	MT-RNR2 like 8 [Source:HGNC Symbol;Acc:HGNC:37165]
NONHSAT193739.1	ENSG00000144674	known	ENSG00000172638	EFEMP2	EGF containing fibulin extracellular matrix protein 2 [Source:HGNC Symbol;Acc:HGNC:3219]
NONHSAT193739.1	ENSG00000144674	known	ENSG00000058085	LAMC2	laminin subunit gamma 2 [Source:HGNC Symbol;Acc:HGNC:6493]
NONHSAT193739.1	ENSG00000144674	known	ENSG00000196611	MMP1	matrix metalloproteinase 1 [Source:HGNC Symbol;Acc:HGNC:7155]
NONHSAT123250.2	ENSG00000128595	known	ENSG00000125398	SOX9	SRY-box transcription factor 9 [Source:HGNC Symbol;Acc:HGNC:11204]
NONHSAT123250.2	ENSG00000128595	known	ENSG00000114315	HES1	hes family bHLH transcription factor 1 [Source:HGNC Symbol;Acc:HGNC:5192]
NONHSAT000917.2	ENSG00000177000	known	ENSG00000169436	COL22A1	collagen type XXII alpha 1 chain [Source:HGNC Symbol;Acc:HGNC:22989]
NONHSAT000917.2	ENSG00000177000	known	ENSG00000283321	AC019117.3	novel protein
NONHSAT193739.1	ENSG00000144674	known	ENSG00000131409	LRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
NONHSAT193739.1	ENSG00000144674	known	ENSG00000107821	KAZALD1	Kazal type serine peptidase inhibitor domain 1 [Source:HGNC Symbol;Acc:HGNC:25460]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000102359	SRPX2	sushi repeat containing protein X-linked 2 [Source:HGNC Symbol;Acc:HGNC:30668]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000100342	APOL1	apolipoprotein L1 [Source:HGNC Symbol;Acc:HGNC:618]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000168874	ATOX8	atonal bHLH transcription factor 8 [Source:HGNC Symbol;Acc:HGNC:24126]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000104967	NOVA2	NOVA alternative splicing regulator 2 [Source:HGNC Symbol;Acc:HGNC:7887]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000107159	CA9	carbonic anhydrase 9 [Source:HGNC Symbol;Acc:HGNC:1383]
ENST00000667654	ENSG00000274265	known	ENSG00000172638	EFEMP2	EGF containing fibulin extracellular matrix protein 2 [Source:HGNC Symbol;Acc:HGNC:3219]
ENST00000667654	ENSG00000274265	known	ENSG00000058085	LAMC2	laminin subunit gamma 2 [Source:HGNC Symbol;Acc:HGNC:6493]
NONHSAT257356.1	ENSG00000171889	known	ENSG00000273706	LHX1	LIM homeobox 1 [Source:HGNC Symbol;Acc:HGNC:6593]
NONHSAT199606.1	ENSG00000281591	known	ENSG00000172602	RND1	Rho family GTPase 1 [Source:HGNC Symbol;Acc:HGNC:18314]
NONHSAT199606.1	ENSG00000281591	known	ENSG00000148677	ANKRD1	ankyrin repeat domain 1 [Source:HGNC Symbol;Acc:HGNC:15819]
NONHSAT199606.1	ENSG00000281591	known	ENSG00000123843	C4BPB	complement component 4 binding protein beta [Source:HGNC Symbol;Acc:HGNC:1328]
NONHSAT199606.1	ENSG00000281591	known	ENSG00000104368	PLAT	plasminogen activator, tissue type [Source:HGNC Symbol;Acc:HGNC:9051]
XR_001755027.1	ENSG00000231324	known	ENSG00000107242	PIP5K1B	phosphatidylinositol-4-phosphate 5-kinase type 1 beta [Source:HGNC Symbol;Acc:HGNC:8995]
XR_001755027.1	ENSG00000231324	known	ENSG00000183111	ARHGEF37	Rho guanine nucleotide exchange factor 37 [Source:HGNC Symbol;Acc:HGNC:34430]
NONHSAT173219.1	ENSG00000102908	known	ENSG00000168676	KCTD19	potassium channel tetramerization domain containing 19 [Source:HGNC Symbol;Acc:HGNC:24753]
NONHSAT173219.1	ENSG00000102908	known	ENSG00000008517	IL32	interleukin 32 [Source:HGNC Symbol;Acc:HGNC:16830]
NONHSAT173219.1	ENSG00000102908	known	ENSG00000078098	FAP	fibroblast activation protein alpha [Source:HGNC Symbol;Acc:HGNC:3590]
NONHSAT173219.1	ENSG00000102908	known	ENSG00000101198	NKAIN4	sodium/potassium transporting ATPase interacting 4 [Source:HGNC Symbol;Acc:HGNC:16191]
XR_001755114.2	ENSG00000280145	known	ENSG00000243649	CFB	complement factor B [Source:HGNC Symbol;Acc:HGNC:1037]
XR_001755114.2	ENSG00000280145	known	ENSG00000167244	IGF2	insulin like growth factor 2 [Source:HGNC Symbol;Acc:HGNC:5466]
XR_001755114.2	ENSG00000280145	known	ENSG00000160886	LY6K	lymphocyte antigen 6 family member K [Source:HGNC Symbol;Acc:HGNC:24225]
NONHSAT003731.2	ENSG00000162433	known	MSTRG.5468		
NONHSAT231312.1	ENSG00000257354	known	ENSG00000273706	LHX1	LIM homeobox 1 [Source:HGNC Symbol;Acc:HGNC:6593]
NONHSAT231312.1	ENSG00000257354	known	ENSG00000168874	ATOX8	atonal bHLH transcription factor 8 [Source:HGNC Symbol;Acc:HGNC:24126]
NONHSAT231312.1	ENSG00000257354	known	ENSG00000104967	NOVA2	NOVA alternative splicing regulator 2 [Source:HGNC Symbol;Acc:HGNC:7887]
NONHSAT231312.1	ENSG00000257354	known	ENSG00000107159	CA9	carbonic anhydrase 9 [Source:HGNC Symbol;Acc:HGNC:1383]
ENST00000434233	ENSG00000218510	known	ENSG00000168477	TNXX	tenascin XB [Source:HGNC Symbol;Acc:HGNC:11976]



NONHSAT231312.1	ENSG00000257354	known	ENSG00000102359	SRPX2	sushi repeat containing protein X-linked 2 [Source:HGNC Symbol;Acc:HGNC:30668]
NONHSAT231312.1	ENSG00000257354	known	ENSG00000100342	APOL1	apolipoprotein L1 [Source:HGNC Symbol;Acc:HGNC:618]
ENST00000662245	ENSG00000203875	known	ENSG00000187957	DNER	delta/notch like EGF repeat containing [Source:HGNC Symbol;Acc:HGNC:24456]
ENST00000662245	ENSG00000203875	known	ENSG00000091262	ABCC6	ATP binding cassette subfamily C member 6 [Source:HGNC Symbol;Acc:HGNC:57]
ENST00000662245	ENSG00000203875	known	ENSG00000101115	SALL4	spalt like transcription factor 4 [Source:HGNC Symbol;Acc:HGNC:15924]
ENST00000662245	ENSG00000203875	known	ENSG00000114315	HES1	hes family bHLH transcription factor 1 [Source:HGNC Symbol;Acc:HGNC:5192]
ENST00000662245	ENSG00000203875	known	ENSG00000167861	HID1	HID1 domain containing [Source:HGNC Symbol;Acc:HGNC:15736]
ENST00000662245	ENSG00000203875	known	ENSG00000181444	ZNF467	zinc finger protein 467 [Source:HGNC Symbol;Acc:HGNC:23154]
ENST00000662245	ENSG00000203875	known	ENSG00000109072	VTN	vitronectin [Source:HGNC Symbol;Acc:HGNC:12724]
ENST00000662245	ENSG00000203875	known	ENSG00000125398	SOX9	SRY-box transcription factor 9 [Source:HGNC Symbol;Acc:HGNC:11204]
ENST00000662245	ENSG00000203875	known	ENSG00000039068	CDH1	cadherin 1 [Source:HGNC Symbol;Acc:HGNC:1748]
NONHSAT013767.2	ENSG00000165732	known	ENSG00000163131	CTSS	cathepsin S [Source:HGNC Symbol;Acc:HGNC:2545]
NONHSAT175847.1	ENSG00000074370	known	ENSG00000109107	ALDOC	aldolase, fructose-bisphosphate C [Source:HGNC Symbol;Acc:HGNC:418]
NONHSAT013767.2	ENSG00000165732	known	ENSG00000166922	SCG5	secretogranin V [Source:HGNC Symbol;Acc:HGNC:10816]
NONHSAT013767.2	ENSG00000165732	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
NONHSAT013767.2	ENSG00000165732	known	ENSG00000203724	C1orf53	chromosome 1 open reading frame 53 [Source:HGNC Symbol;Acc:HGNC:30003]
NONHSAT175847.1	ENSG00000074370	known	ENSG00000259803	SLC22A31	solute carrier family 22 member 31 [Source:HGNC Symbol;Acc:HGNC:27091]
ENST00000662245	ENSG00000203875	known	ENSG00000197774	EME2	essential meiotic structure-specific endonuclease subunit 2 [Source:HGNC Symbol;Acc:HGNC:27289]
NONHSAT175847.1	ENSG00000074370	known	ENSG00000089127	OAS1	2'-5'-oligoadenylate synthetase 1 [Source:HGNC Symbol;Acc:HGNC:8086]
ENST00000375642	ENSG00000204387	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
NONHSAT193792.1	ENSG00000230084	known	ENSG00000183111	ARHGEF37	Rho guanine nucleotide exchange factor 37 [Source:HGNC Symbol;Acc:HGNC:34430]
NONHSAT193792.1	ENSG00000230084	known	ENSG00000107242	PIP5K1B	phosphatidylinositol-4-phosphate 5-kinase type 1 beta [Source:HGNC Symbol;Acc:HGNC:8995]
ENST00000375633	ENSG00000204387	known	ENSG00000172638	EFEMP2	EGF containing fibulin extracellular matrix protein 2 [Source:HGNC Symbol;Acc:HGNC:3219]
ENST00000375633	ENSG00000204387	known	ENSG00000058085	LAMC2	laminin subunit gamma 2 [Source:HGNC Symbol;Acc:HGNC:6493]
ENST00000375633	ENSG00000204387	known	ENSG00000196611	MMP1	matrix metalloproteinase 1 [Source:HGNC Symbol;Acc:HGNC:7155]
ENST00000375633	ENSG00000204387	known	ENSG00000131409	LRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
ENST00000375633	ENSG00000204387	known	ENSG00000107821	KAZALD1	Kazal type serine peptidase inhibitor domain 1 [Source:HGNC Symbol;Acc:HGNC:25460]
ENST00000455395	ENSG00000230590	known	ENSG00000125730	C3	complement C3 [Source:HGNC Symbol;Acc:HGNC:1318]
ENST00000455395	ENSG00000230590	known	ENSG00000143369	ECM1	extracellular matrix protein 1 [Source:HGNC Symbol;Acc:HGNC:3153]
ENST00000455395	ENSG00000230590	known	ENSG00000243244	STON1	stonin 1 [Source:HGNC Symbol;Acc:HGNC:17003]
ENST00000609111	ENSG00000272734	known	ENSG00000085831	TTC39A	tetratricopeptide repeat domain 39A [Source:HGNC Symbol;Acc:HGNC:18657]
ENST00000609111	ENSG00000272734	known	ENSG00000276600	RAB7B	RAB7B, member RAS oncogene family [Source:HGNC Symbol;Acc:HGNC:30513]
ENST00000664939	ENSG00000175061	known	ENSG00000166922	SCG5	secretogranin V [Source:HGNC Symbol;Acc:HGNC:10816]
ENST00000664939	ENSG00000175061	known	ENSG00000165821	SALL2	spalt like transcription factor 2 [Source:HGNC Symbol;Acc:HGNC:10526]
ENST00000664939	ENSG00000175061	known	ENSG00000203724	C1orf53	chromosome 1 open reading frame 53 [Source:HGNC Symbol;Acc:HGNC:30003]
ENST00000430034	ENSG00000240801	known	ENSG00000058085	LAMC2	laminin subunit gamma 2 [Source:HGNC Symbol;Acc:HGNC:6493]
ENST00000430034	ENSG00000240801	known	ENSG00000196611	MMP1	matrix metalloproteinase 1 [Source:HGNC Symbol;Acc:HGNC:7155]
ENST00000430034	ENSG00000240801	known	ENSG00000131409	LRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
ENST00000430034	ENSG00000240801	known	ENSG00000172638	EFEMP2	EGF containing fibulin extracellular matrix protein 2 [Source:HGNC Symbol;Acc:HGNC:3219]
ENST00000430034	ENSG00000240801	known	ENSG00000107821	KAZALD1	Kazal type serine peptidase inhibitor domain 1 [Source:HGNC Symbol;Acc:HGNC:25460]
ENST00000668253	ENSG00000248008	known	ENSG00000243244	STON1	stonin 1 [Source:HGNC Symbol;Acc:HGNC:17003]
ENST00000668253	ENSG00000248008	known	ENSG00000134339	SAA2	serum amyloid A2 [Source:HGNC Symbol;Acc:HGNC:10514]
ENST00000668253	ENSG00000248008	known	ENSG00000143369	ECM1	extracellular matrix protein 1 [Source:HGNC Symbol;Acc:HGNC:3153]
ENST00000668253	ENSG00000248008	known	ENSG00000125730	C3	complement C3 [Source:HGNC Symbol;Acc:HGNC:1318]
ENST00000655606	ENSG00000223745	known	ENSG00000166924	NYAP1	neuronal tyrosine phosphorylated phosphoinositide-3-kinase adaptor 1 [Source:HGNC Symbol;Acc:HGNC:22009]
ENST00000547387	ENSG00000258017	known	MSTRG.5832		
ENST00000547387	ENSG00000258017	known	ENSG00000117594	HSD11B1	hydroxysteroid 11-beta dehydrogenase 1 [Source:HGNC Symbol;Acc:HGNC:5208]
ENST00000547387	ENSG00000258017	known	ENSG00000173432	SAA1	serum amyloid A1 [Source:HGNC Symbol;Acc:HGNC:10513]
ENST00000547387	ENSG00000258017	known	ENSG00000125895	TMEM74B	transmembrane protein 74B [Source:HGNC Symbol;Acc:HGNC:15893]

ENST00000550290	ENSG00000257354	known	ENSG00000173531	MST1	macrophage stimulating 1 [Source:HGNC Symbol;Acc:HGNC:7380]
ENST00000550290	ENSG00000257354	known	ENSG00000176692	FOXC2	forkhead box C2 [Source:HGNC Symbol;Acc:HGNC:3801]
NONHSAT135828.2	ENSG00000198886	known	ENSG00000137878	GCOM1	GRINL1A complex locus 1 [Source:HGNC Symbol;Acc:HGNC:26424]
NONHSAT135828.2	ENSG00000198886	known	ENSG00000105559	PLEKHA4	pleckstrin homology domain containing A4 [Source:HGNC Symbol;Acc:HGNC:14339]
NONHSAT135828.2	ENSG00000198886	known	ENSG00000090238	YPEL3	yippee like 3 [Source:HGNC Symbol;Acc:HGNC:18327]
ENST00000550290	ENSG00000257354	known	ENSG00000162366	PDZK1IP1	PDZK1 interacting protein 1 [Source:HGNC Symbol;Acc:HGNC:16887]
ENST00000550290	ENSG00000257354	known	ENSG00000145920	CPLX2	complexin 2 [Source:HGNC Symbol;Acc:HGNC:2310]
NONHSAT112918.2	ENSG00000272114	known	ENSG00000134339	SAA2	serum amyloid A2 [Source:HGNC Symbol;Acc:HGNC:10514]
ENST00000652379	ENSG00000280441	known	ENSG00000131409	LRRC4B	leucine rich repeat containing 4B [Source:HGNC Symbol;Acc:HGNC:25042]
ENST00000475197	ENSG00000231177	known	ENSG00000273706	LHX1	LIM homeobox 1 [Source:HGNC Symbol;Acc:HGNC:6593]
ENST00000475197	ENSG00000231177	known	ENSG00000168874	ATOH8	atonal bHLH transcription factor 8 [Source:HGNC Symbol;Acc:HGNC:24126]
ENST00000475197	ENSG00000231177	known	ENSG00000104967	NOVA2	NOVA alternative splicing regulator 2 [Source:HGNC Symbol;Acc:HGNC:7887]
ENST00000664939	ENSG00000175061	known	ENSG00000163131	CTSS	cathepsin S [Source:HGNC Symbol;Acc:HGNC:2545]
ENST00000652379	ENSG00000280441	known	ENSG00000149927	DOC2A	double C2 domain alpha [Source:HGNC Symbol;Acc:HGNC:2985]
ENST00000652379	ENSG00000280441	known	ENSG00000166920	C15orf48	chromosome 15 open reading frame 48 [Source:HGNC Symbol;Acc:HGNC:29898]
ENST00000652379	ENSG00000280441	known	ENSG00000140398	NEIL1	nei like DNA glycosylase 1 [Source:HGNC Symbol;Acc:HGNC:18448]
ENST00000475197	ENSG00000231177	known	ENSG00000107159	CA9	carbonic anhydrase 9 [Source:HGNC Symbol;Acc:HGNC:1383]
NONHSAT112918.2	ENSG00000272114	known	ENSG00000125730	C3	complement C3 [Source:HGNC Symbol;Acc:HGNC:1318]
NONHSAT112918.2	ENSG00000272114	known	ENSG00000143369	ECM1	extracellular matrix protein 1 [Source:HGNC Symbol;Acc:HGNC:3153]
NONHSAT112918.2	ENSG00000272114	known	ENSG00000243244	STON1	stonin 1 [Source:HGNC Symbol;Acc:HGNC:17003]
ENST00000475197	ENSG00000231177	known	ENSG00000102359	SRPX2	sushi repeat containing protein X-linked 2 [Source:HGNC Symbol;Acc:HGNC:30668]
ENST00000475197	ENSG00000231177	known	ENSG00000100342	APOL1	apolipoprotein L1 [Source:HGNC Symbol;Acc:HGNC:618]
ENST00000501122	ENSG00000245532	known	ENSG00000168676	KCTD19	potassium channel tetramerization domain containing 19 [Source:HGNC Symbol;Acc:HGNC:24753]
ENST00000501122	ENSG00000245532	known	ENSG00000101198	NKAIN4	sodium/potassium transporting ATPase interacting 4 [Source:HGNC Symbol;Acc:HGNC:16191]
ENST00000501122	ENSG00000245532	known	ENSG00000078098	FAP	fibroblast activation protein alpha [Source:HGNC Symbol;Acc:HGNC:3590]
ENST00000501122	ENSG00000245532	known	ENSG00000008517	IL32	interleukin 32 [Source:HGNC Symbol;Acc:HGNC:16830]
NONHSAT140312.2	ENSG00000140632	known	ENSG00000269028	MTRNR2L2	MT-RNR2 like 12 [Source:HGNC Symbol;Acc:HGNC:37169]
NONHSAT140312.2	ENSG00000140632	known	ENSG00000130827	PLXNA3	plexin A3 [Source:HGNC Symbol;Acc:HGNC:9101]
NONHSAT140312.2	ENSG00000140632	known	MSTRG.5468		
NONHSAT140312.2	ENSG00000140632	known	ENSG00000137965	IFI44	interferon induced protein 44 [Source:HGNC Symbol;Acc:HGNC:16938]
NONHSAT140312.2	ENSG00000140632	known	ENSG00000100027	YPEL1	yippee like 1 [Source:HGNC Symbol;Acc:HGNC:12845]
ENST00000658813	ENSG00000223546	known	ENSG00000163131	CTSS	cathepsin S [Source:HGNC Symbol;Acc:HGNC:2545]
ENST00000609983	ENSG00000234608	known	ENSG000000089127	OAS1	2'-5'-oligoadenylate synthetase 1 [Source:HGNC Symbol;Acc:HGNC:8086]
ENST00000609983	ENSG00000234608	known	ENSG00000259803	SLC22A31	solute carrier family 22 member 31 [Source:HGNC Symbol;Acc:HGNC:27091]
ENST00000609983	ENSG00000234608	known	ENSG00000074370	ATP2A3	ATPase sarcoplasmic/endoplasmic reticulum Ca <sup>2+</sup> transporting 3 [Source:HGNC Symbol;Acc:HGNC:813]
ENST00000609983	ENSG00000234608	known	ENSG00000109107	ALDOC	aldolase, fructose-bisphosphate C [Source:HGNC Symbol;Acc:HGNC:418]

phycocyanin exposure [21]. The similar conclusions of the two studies have reflected the potential regulatory mechanism of phycocyanin on NSCLC cells.

### Establishment of the LncRNA -mRNA and target gene coexpression networks

As shown in Supplementary Figure S1, a comprehensive LncRNA -mRNA coexpression network was constructed. A total of 2,238 mRNA-mRNA, LncRNA -LncRNA, and LncRNA -mRNA pairs were identified, showing the potential mutual effects of DE LncRNA s and mRNAs. Detailed information on LncRNA s and mRNAs is presented in Table S7. It is worth noting that ENSG00000130600 (LncRNA) and ENSG00000172638 (mRNA) showed the highest negative correlation coefficient ( $p\text{-adjust} < 0.01$ ), while ENSG00000258479 (LncRNA) and ENSG00000188747 (mRNA) showed the highest positive correlation coefficient ( $p\text{-adjust} < 0.01$ ). In addition, one mRNA with high correlation coefficient (such as ENSG00000188747) might have a regulatory relationship with multiple mRNAs and LncRNA s, including ENSG00000008517 (mRNA), ENSG00000078098 (mRNA), and ENSG00000254815 (LncRNA). The LncRNA -mRNA

network revealed the underlying complex regulatory mechanisms of phycocyanin in A549 cells, providing a potential theoretical basis for NSCLC treatment.

To further investigate the interactions between DE LncRNA s and target genes, an interaction network was constructed. As shown in Figure 3A, 72 target genes were present in the interaction network. Several genes were found to exert high node degree in the network, including cadherin 1 (CDH1, node degree [18], SRY-box transcription Factor 9 (SOX9, node degree G. [10], and serpin family A member 1 (SERPINA1, node degree [8], which suggests that these genes probably play vital roles in phycocyanin-mediated regulatory processes via LncRNA s in A549 cells. Moreover, LncRNA s also regulated multiple target genes in a cross-talk manner (Figure 3B). LncRNA ENST000000662245 was downregulated in phycocyanin-treated A549 cells and regulated the expression of CDH1, SOX9, and VTN (vitronectin). Additionally, ENST00000538717 was downregulated in the PC groups and affected the expression of IGF2 and MBF. Coincidentally, the mRNA-seq in our previous work has discovered multiple pathways and signal molecules involved in phycocyanin-mediated inhibition of NSCLC cells.





**Table S7:** Detailed information of lncRNA-mRNA co-expression network.

Gene id	RNA type	Connected gene id	RNA type	Corr	pvalue	padjust
ENSG00000130600	lncRNA	ENSG00000244474	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000109107	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000172638	mRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000140398	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	MSTRG.14266	lncRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000172824	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000255823	mRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000258908	lncRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000240801	lncRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000149927	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000169436	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000288093	lncRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000181444	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000058085	mRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000283321	mRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000237781	lncRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000287929	lncRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000196611	mRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000166920	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000089127	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000179148	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000107821	mRNA	-1	0	0
ENSG00000130600	lncRNA	ENSG00000131409	mRNA	-0.985611	0.000309	0.008045
ENSG00000130600	lncRNA	ENSG00000259803	mRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000229921	lncRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000279954	lncRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000114315	mRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000125398	mRNA	0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	MSTRG.32594	lncRNA	-0.942857	0.004805	0.039507
ENSG00000130600	lncRNA	ENSG00000272114	lncRNA	-1	0	0
ENSG00000188747	mRNA	ENSG00000287421	lncRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000104368	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000186862	mRNA	0.985611	0.000309	0.008045
ENSG00000188747	mRNA	ENSG00000167861	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000183111	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000162687	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000266560	lncRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000168676	mRNA	0.985611	0.000309	0.008045
ENSG00000188747	mRNA	ENSG00000264940	lncRNA	-0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000245532	lncRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000258479	lncRNA	1	0	0
ENSG00000188747	mRNA	ENSG00000039068	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000008517	mRNA	1	0	0
ENSG00000188747	mRNA	ENSG00000275638	lncRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000107242	mRNA	-0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000116032	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000172602	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000078098	mRNA	1	0	0
ENSG00000188747	mRNA	ENSG00000265185	lncRNA	-1	0	0
ENSG00000188747	mRNA	ENSG00000187957	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000254815	lncRNA	1	0	0
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ENSG00000188747	mRNA	ENSG00000091262	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000123843	mRNA	-0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000269888	lncRNA	-0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000148677	mRNA	-0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000140009	mRNA	0.942857	0.004805	0.039507



ENSG00000188747	mRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000188747	mRNA	ENSG00000197558	mRNA	1	0	0
ENSG00000136275	lncRNA	ENSG00000145920	mRNA	-1	0	0
ENSG00000136275	lncRNA	ENSG00000166750	mRNA	0.942857	0.004805	0.039507
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ENSG00000136275	lncRNA	ENSG00000115844	mRNA	-0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000250708	lncRNA	0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000185168	lncRNA	0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000023445	mRNA	-0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000164078	mRNA	1	0	0
ENSG00000136275	lncRNA	ENSG00000173531	mRNA	1	0	0
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ENSG00000136275	lncRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000007516	mRNA	0.942857	0.004805	0.039507
ENSG00000136275	lncRNA	ENSG00000176692	mRNA	-1	0	0
ENSG00000258225	lncRNA	ENSG00000273706	mRNA	0.942857	0.004805	0.039507
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ENSG00000258225	lncRNA	ENSG00000168874	mRNA	-0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000143355	mRNA	0.985611	0.000309	0.008045
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ENSG00000258225	lncRNA	ENSG00000149927	mRNA	0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000288093	lncRNA	0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000104967	mRNA	0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000278740	lncRNA	0.942857	0.004805	0.039507
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ENSG00000258225	lncRNA	MSTRG.26092	lncRNA	0.985611	0.000309	0.008045
ENSG00000258225	lncRNA	ENSG00000107731	mRNA	-0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000168477	mRNA	1	0	0
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ENSG00000258225	lncRNA	ENSG00000149809	mRNA	0.942857	0.004805	0.039507
ENSG00000258225	lncRNA	ENSG00000183691	mRNA	-0.942857	0.004805	0.039507
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ENSG00000244474	mRNA	ENSG00000286715	lncRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000240801	lncRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000167861	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000183111	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000162687	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000058085	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000287929	lncRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000196611	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000245532	lncRNA	0.942857	0.004805	0.039507
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ENSG00000244474	mRNA	ENSG00000039068	mRNA	0.942857	0.004805	0.039507
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ENSG00000244474	mRNA	ENSG00000259803	mRNA	1	0	0
ENSG00000244474	mRNA	ENSG00000091262	mRNA	0.942857	0.004805	0.039507
ENSG00000244474	mRNA	ENSG00000229921	lncRNA	1	0	0
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ENSG00000244474	mRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
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ENSG00000197774	mRNA	ENSG00000181444	mRNA	0.985611	0.000309	0.008045
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ENSG00000260693	lncRNA	ENSG00000237892	lncRNA	1	0	0
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ENSG00000260693	lncRNA	ENSG00000125895	mRNA	0.942857	0.004805	0.039507
ENSG00000260693	lncRNA	ENSG00000137878	mRNA	0.942857	0.004805	0.039507
ENSG00000260693	lncRNA	ENSG00000105559	mRNA	0.942857	0.004805	0.039507
ENSG00000260693	lncRNA	ENSG00000090238	mRNA	0.942857	0.004805	0.039507
ENSG00000260693	lncRNA	ENSG00000197249	mRNA	1	0	0
ENSG00000168874	mRNA	ENSG00000143355	mRNA	-0.985611	0.000309	0.008045
ENSG00000168874	mRNA	ENSG00000286715	lncRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000104967	mRNA	-1	0	0
ENSG00000168874	mRNA	ENSG00000107159	mRNA	-0.985611	0.000309	0.008045
ENSG00000168874	mRNA	ENSG00000130584	mRNA	-0.985611	0.000309	0.008045
ENSG00000168874	mRNA	ENSG00000168477	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000265972	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000266714	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000253317	lncRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000183691	mRNA	1	0	0
ENSG00000168874	mRNA	ENSG00000145020	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000137878	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000102359	mRNA	-1	0	0
ENSG00000168874	mRNA	ENSG00000105559	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000090238	mRNA	-0.942857	0.004805	0.039507
ENSG00000168874	mRNA	ENSG00000100342	mRNA	-1	0	0
ENSG00000168874	mRNA	ENSG00000179111	mRNA	-0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000166750	mRNA	-0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000162366	mRNA	-0.985611	0.000309	0.008045
ENSG00000145920	mRNA	ENSG00000167549	mRNA	-0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000165029	mRNA	-0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000115844	mRNA	0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000250708	lncRNA	-0.942857	0.004805	0.039507



ENSG00000145920	mRNA	ENSG00000185168	lncRNA	-0.942857	0.004805	0.039507
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ENSG00000145920	mRNA	ENSG00000221571	lncRNA	0.942857	0.004805	0.039507
ENSG00000145920	mRNA	ENSG00000007516	mRNA	-0.942857	0.004805	0.039507
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ENSG00000105963	mRNA	ENSG00000117594	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000173432	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000203392	lncRNA	-0.942857	0.004805	0.039507
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ENSG00000105963	mRNA	ENSG00000166924	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	MSTRG.5832	mRNA	0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000196189	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000266714	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000120693	mRNA	1	0	0
ENSG00000105963	mRNA	ENSG00000145020	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000125895	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000137878	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000105559	mRNA	-0.942857	0.004805	0.039507
ENSG00000105963	mRNA	ENSG00000090238	mRNA	-0.942857	0.004805	0.039507
MSTRG.14266	lncRNA	ENSG00000286715	lncRNA	-0.942857	0.004805	0.039507
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MSTRG.14266	lncRNA	ENSG00000179148	mRNA	-1	0	0
MSTRG.14266	lncRNA	ENSG00000275638	lncRNA	-0.942857	0.004805	0.039507
MSTRG.14266	lncRNA	ENSG00000107242	mRNA	0.942857	0.004805	0.039507
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MSTRG.14266	lncRNA	ENSG00000259803	mRNA	-1	0	0
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MSTRG.14266	lncRNA	ENSG00000229921	lncRNA	-1	0	0
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MSTRG.14266	lncRNA	ENSG00000109072	mRNA	-0.942857	0.004805	0.039507
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MSTRG.14266	lncRNA	ENSG00000226416	lncRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	MSTRG.5468	mRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000167549	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000165029	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000250708	lncRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000264940	lncRNA	-1	0	0
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ENSG00000287421	lncRNA	ENSG00000130827	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000080031	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000231324	lncRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000164182	mRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000269028	mRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000185168	lncRNA	0.942857	0.004805	0.039507

ENSG00000287421	lncRNA	ENSG00000008517	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000023445	mRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000198203	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000078098	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000265185	lncRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000255182	lncRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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ENSG00000287421	lncRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000269888	lncRNA	-1	0	0
ENSG00000287421	lncRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000137965	mRNA	0.942857	0.004805	0.039507
ENSG00000287421	lncRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000143355	mRNA	ENSG00000104967	mRNA	0.985611	0.000309	0.008045
ENSG00000143355	mRNA	ENSG00000107159	mRNA	0.970588	0.001285	0.032602
ENSG00000143355	mRNA	MSTRG.26092	lncRNA	0.955882	0.002877	0.039507
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ENSG00000143355	mRNA	ENSG00000168477	mRNA	0.985611	0.000309	0.008045
ENSG00000143355	mRNA	ENSG00000183691	mRNA	-0.985611	0.000309	0.008045
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ENSG00000117594	mRNA	ENSG00000173432	mRNA	1	0	0
ENSG00000117594	mRNA	ENSG00000129226	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000238007	lncRNA	0.985611	0.000309	0.008045
ENSG00000117594	mRNA	ENSG00000203392	lncRNA	1	0	0
ENSG00000117594	mRNA	MSTRG.5468	mRNA	-0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000130827	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000080031	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000231324	lncRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000269028	mRNA	-0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000287275	lncRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	MSTRG.5832	mRNA	-1	0	0
ENSG00000117594	mRNA	ENSG00000198203	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000196189	mRNA	1	0	0
ENSG00000117594	mRNA	ENSG00000240764	mRNA	0.942857	0.004805	0.039507
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ENSG00000117594	mRNA	ENSG00000159753	mRNA	-0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000120693	mRNA	-0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000237892	lncRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000125895	mRNA	1	0	0
ENSG00000117594	mRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000117594	mRNA	ENSG00000137965	mRNA	0.942857	0.004805	0.039507
ENSG00000137959	mRNA	ENSG00000177409	mRNA	0.985611	0.000309	0.008045
ENSG00000137959	mRNA	ENSG00000104368	mRNA	0.942857	0.004805	0.039507
ENSG00000137959	mRNA	ENSG00000266560	lncRNA	0.942857	0.004805	0.039507
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ENSG00000137959	mRNA	ENSG00000073282	mRNA	1	0	0
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ENSG00000137959	mRNA	ENSG00000265972	mRNA	0.942857	0.004805	0.039507
ENSG00000137959	mRNA	ENSG00000266714	mRNA	0.942857	0.004805	0.039507
ENSG00000137959	mRNA	ENSG00000253317	lncRNA	0.942857	0.004805	0.039507
ENSG00000137959	mRNA	ENSG00000142619	mRNA	1	0	0
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ENSG00000137959	mRNA	ENSG00000137878	mRNA	0.942857	0.004805	0.039507
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ENSG00000137959	mRNA	ENSG00000105559	mRNA	0.942857	0.004805	0.039507
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ENSG00000286715	lncRNA	ENSG00000129226	mRNA	0.942857	0.004805	0.039507
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ENSG00000286715	lncRNA	ENSG00000288093	lncRNA	0.942857	0.004805	0.039507
ENSG00000286715	lncRNA	ENSG00000104967	mRNA	0.942857	0.004805	0.039507
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ENSG00000286715	lncRNA	ENSG00000240764	mRNA	0.942857	0.004805	0.039507
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ENSG00000286715	lncRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
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ENSG00000286715	lncRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000173432	mRNA	ENSG00000129226	mRNA	0.942857	0.004805	0.039507
ENSG00000173432	mRNA	ENSG00000238007	lncRNA	0.985611	0.000309	0.008045
ENSG00000173432	mRNA	ENSG00000203392	lncRNA	1	0	0
ENSG00000173432	mRNA	MSTRG.5468	mRNA	-0.942857	0.004805	0.039507
ENSG00000173432	mRNA	ENSG00000130827	mRNA	0.942857	0.004805	0.039507
ENSG00000173432	mRNA	ENSG00000080031	mRNA	0.942857	0.004805	0.039507
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ENSG00000173432	mRNA	MSTRG.5832	mRNA	-1	0	0
ENSG00000173432	mRNA	ENSG00000198203	mRNA	0.942857	0.004805	0.039507
ENSG00000173432	mRNA	ENSG00000196189	mRNA	1	0	0
ENSG00000173432	mRNA	ENSG00000240764	mRNA	0.942857	0.004805	0.039507
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ENSG00000173432	mRNA	ENSG00000237892	lncRNA	0.942857	0.004805	0.039507
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ENSG00000173432	mRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
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ENSG00000129226	mRNA	MSTRG.5832	mRNA	-0.942857	0.004805	0.039507
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ENSG00000129226	mRNA	ENSG00000197249	mRNA	1	0	0
ENSG00000177409	mRNA	ENSG00000073282	mRNA	0.985611	0.000309	0.008045
ENSG00000177409	mRNA	ENSG00000100867	mRNA	0.985611	0.000309	0.008045
ENSG00000177409	mRNA	ENSG00000107159	mRNA	0.970588	0.001285	0.032602
ENSG00000177409	mRNA	ENSG00000265972	mRNA	0.985611	0.000309	0.008045
ENSG00000177409	mRNA	ENSG00000253317	lncRNA	0.985611	0.000309	0.008045
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ENSG00000177409	mRNA	MSTRG.15840	mRNA	-0.954864	0.00301	0.039507
ENSG00000177409	mRNA	ENSG00000158825	mRNA	0.985611	0.000309	0.008045
ENSG00000177409	mRNA	ENSG00000179111	mRNA	0.985611	0.000309	0.008045
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ENSG00000104368	mRNA	ENSG00000105246	mRNA	0.942857	0.004805	0.039507
ENSG00000104368	mRNA	ENSG00000266560	lncRNA	1	0	0
ENSG00000104368	mRNA	ENSG00000073282	mRNA	0.942857	0.004805	0.039507
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ENSG00000104368	mRNA	ENSG00000100867	mRNA	0.942857	0.004805	0.039507
ENSG00000104368	mRNA	ENSG00000214353	lncRNA	0.985611	0.000309	0.008045
ENSG00000104368	mRNA	ENSG00000258479	lncRNA	0.942857	0.004805	0.039507
ENSG00000104368	mRNA	ENSG00000008517	mRNA	0.942857	0.004805	0.039507
ENSG00000104368	mRNA	ENSG00000172602	mRNA	1	0	0
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ENSG00000104368	mRNA	ENSG00000104888	mRNA	0.985611	0.000309	0.008045
ENSG00000104368	mRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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MSTRG.16716	mRNA	ENSG00000170044	mRNA	-0.942857	0.004805	0.039507
MSTRG.16716	mRNA	ENSG00000127528	mRNA	0.942857	0.004805	0.039507
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ENSG00000167861	mRNA	ENSG00000179148	mRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000078098	mRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000265185	lncRNA	-0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000240219	lncRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000187957	mRNA	1	0	0
ENSG00000167861	mRNA	ENSG00000259803	mRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
ENSG00000167861	mRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000101198	mRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000091262	mRNA	1	0	0
ENSG00000167861	mRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
ENSG00000167861	mRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000279954	lncRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000101115	mRNA	1	0	0
ENSG00000167861	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000109072	mRNA	1	0	0
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ENSG00000167861	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000167861	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000167861	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000167861	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000238007	lncRNA	ENSG00000203392	lncRNA	0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	MSTRG.5468	mRNA	-0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000130827	mRNA	0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000080031	mRNA	0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000231324	lncRNA	0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000269028	mRNA	-0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	MSTRG.5832	mRNA	-0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000198203	mRNA	0.985611	0.000309	0.008045
ENSG00000238007	lncRNA	ENSG00000196189	mRNA	0.985611	0.000309	0.008045
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ENSG00000238007	lncRNA	ENSG00000255182	lncRNA	0.985611	0.000309	0.008045
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ENSG00000238007	lncRNA	ENSG00000137965	mRNA	0.985611	0.000309	0.008045
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ENSG00000143369	mRNA	ENSG00000159753	mRNA	-0.942857	0.004805	0.039507
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ENSG00000149927	mRNA	ENSG00000131409	mRNA	0.985611	0.000309	0.008045
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ENSG00000149926	mRNA	MSTRG.34348	lncRNA	-1	0	0
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ENSG00000170044	mRNA	MSTRG.22782	mRNA	0.942857	0.004805	0.039507
ENSG00000170044	mRNA	ENSG00000107731	mRNA	-0.942857	0.004805	0.039507
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ENSG00000203392	lncRNA	ENSG00000137965	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000181444	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000237781	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000168676	mRNA	0.985611	0.000309	0.008045
ENSG00000162687	mRNA	ENSG00000118898	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000245532	lncRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000258479	lncRNA	0.942857	0.004805	0.039507
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ENSG00000162687	mRNA	ENSG00000074370	mRNA	0.985611	0.000309	0.008045

ENSG00000162687	mRNA	ENSG00000039068	mRNA	1	0	0
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ENSG00000162687	mRNA	ENSG00000179148	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000078098	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000265185	lncRNA	-0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000240219	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000187957	mRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000259803	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
ENSG00000162687	mRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000101198	mRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000091262	mRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
ENSG00000162687	mRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000279954	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000101115	mRNA	1	0	0
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ENSG00000162687	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000109072	mRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000162687	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000162687	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000162687	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
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ENSG00000181444	mRNA	ENSG00000237781	lncRNA	1	0	0
ENSG00000181444	mRNA	ENSG00000287929	lncRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000196611	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000166922	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000245532	lncRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000263590	lncRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000039068	mRNA	0.942857	0.004805	0.039507
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ENSG00000181444	mRNA	ENSG00000117266	mRNA	0.942857	0.004805	0.039507
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ENSG00000181444	mRNA	ENSG00000107821	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000275620	lncRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000248479	lncRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000160886	mRNA	-0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000091262	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000162804	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000181444	mRNA	ENSG00000114315	mRNA	-1	0	0
ENSG00000181444	mRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
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ENSG00000181444	mRNA	MSTRG.32594	lncRNA	1	0	0
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ENSG00000181444	mRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000162366	mRNA	ENSG00000167549	mRNA	0.985611	0.000309	0.008045
ENSG00000162366	mRNA	ENSG00000165029	mRNA	0.985611	0.000309	0.008045
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ENSG00000162366	mRNA	ENSG00000023445	mRNA	-0.985611	0.000309	0.008045
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ENSG00000162366	mRNA	ENSG00000173531	mRNA	0.985611	0.000309	0.008045
ENSG00000162366	mRNA	ENSG00000134339	mRNA	0.955882	0.002877	0.039507
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ENSG00000162366	mRNA	ENSG00000221571	lncRNA	-0.985611	0.000309	0.008045



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MSTRG.12194	mRNA	ENSG00000127528	mRNA	-0.985611	0.000309	0.008045
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ENSG00000058085	mRNA	ENSG00000237781	lncRNA	0.942857	0.004805	0.039507
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ENSG00000058085	mRNA	ENSG00000089127	mRNA	0.942857	0.004805	0.039507
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ENSG00000058085	mRNA	ENSG00000107821	mRNA	1	0	0
ENSG00000058085	mRNA	ENSG00000131409	mRNA	0.985611	0.000309	0.008045
ENSG00000058085	mRNA	ENSG00000259803	mRNA	0.942857	0.004805	0.039507
ENSG00000058085	mRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
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ENSG00000058085	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
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ENSG00000058085	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
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ENSG000000283321	mRNA	ENSG00000287929	lncRNA	-0.942857	0.004805	0.039507
ENSG000000283321	mRNA	ENSG00000196611	mRNA	-0.942857	0.004805	0.039507
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ENSG000000283321	mRNA	MSTRG.34348	lncRNA	0.942857	0.004805	0.039507
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ENSG000000283321	mRNA	ENSG00000163131	mRNA	-0.942857	0.004805	0.039507
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MSTRG.12841	mRNA	MSTRG.34348	lncRNA	-1	0	0
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ENSG000000266560	lncRNA	ENSG00000073282	mRNA	0.942857	0.004805	0.039507
ENSG000000266560	lncRNA	ENSG00000118898	mRNA	0.942857	0.004805	0.039507

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ENSG00000266560	lncRNA	ENSG00000214353	lncRNA	0.985611	0.000309	0.008045
ENSG00000266560	lncRNA	ENSG00000258479	lncRNA	0.942857	0.004805	0.039507
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ENSG00000266560	lncRNA	ENSG00000172602	mRNA	1	0	0
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ENSG00000266560	lncRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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ENSG00000266560	lncRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
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ENSG00000237781	lncRNA	ENSG00000245532	lncRNA	0.942857	0.004805	0.039507
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ENSG00000237781	lncRNA	ENSG00000117266	mRNA	0.942857	0.004805	0.039507
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ENSG00000237781	lncRNA	ENSG00000125398	mRNA	-1	0	0
ENSG00000237781	lncRNA	MSTRG.32594	lncRNA	1	0	0
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ENSG00000287929	lncRNA	ENSG00000107821	mRNA	1	0	0
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ENSG00000287929	lncRNA	ENSG00000259803	mRNA	0.942857	0.004805	0.039507
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ENSG00000287929	lncRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000287929	lncRNA	ENSG00000272114	lncRNA	1	0	0
ENSG00000127528	mRNA	ENSG00000278740	lncRNA	-0.942857	0.004805	0.039507

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ENSG00000127528	mRNA	MSTRG.22782	mRNA	-0.942857	0.004805	0.039507
ENSG00000127528	mRNA	ENSG00000107731	mRNA	0.942857	0.004805	0.039507
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ENSG00000127528	mRNA	ENSG00000261080	lncRNA	-0.942857	0.004805	0.039507
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ENSG00000232949	lncRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000232949	lncRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000146411	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000235852	lncRNA	-0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000166924	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	MSTRG.26092	lncRNA	0.985611	0.000309	0.008045
ENSG00000278740	lncRNA	ENSG00000085831	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000107731	mRNA	-1	0	0
ENSG00000278740	lncRNA	ENSG00000168477	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000104081	mRNA	0.942857	0.004805	0.039507
ENSG00000278740	lncRNA	ENSG00000261080	lncRNA	1	0	0
ENSG00000278740	lncRNA	ENSG00000163435	mRNA	1	0	0
ENSG00000278740	lncRNA	ENSG00000267740	mRNA	-1	0	0
ENSG00000278740	lncRNA	ENSG00000276600	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000165029	mRNA	1	0	0
ENSG00000167549	mRNA	ENSG00000250708	lncRNA	1	0	0
ENSG00000167549	mRNA	ENSG00000264940	lncRNA	-0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000166922	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000263590	lncRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	MSTRG.34348	lncRNA	-0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000243244	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000185168	lncRNA	1	0	0
ENSG00000167549	mRNA	ENSG00000023445	mRNA	-1	0	0
ENSG00000167549	mRNA	ENSG00000164078	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000173531	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000134339	mRNA	0.985611	0.000309	0.008045

ENSG00000167549	mRNA	ENSG00000248479	lncRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000162804	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000119508	mRNA	-0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000221571	lncRNA	-1	0	0
ENSG00000167549	mRNA	ENSG00000129946	mRNA	0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000269888	lncRNA	-0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000176692	mRNA	-0.942857	0.004805	0.039507
ENSG00000167549	mRNA	ENSG00000163131	mRNA	0.942857	0.004805	0.039507
ENSG00000165029	mRNA	ENSG00000250708	lncRNA	1	0	0
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ENSG00000165029	mRNA	ENSG00000166922	mRNA	0.942857	0.004805	0.039507
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ENSG00000165029	mRNA	ENSG00000185168	lncRNA	1	0	0
ENSG00000165029	mRNA	ENSG00000023445	mRNA	-1	0	0
ENSG00000165029	mRNA	ENSG00000164078	mRNA	0.942857	0.004805	0.039507
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ENSG00000073282	mRNA	ENSG00000265972	mRNA	0.942857	0.004805	0.039507
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ENSG00000073282	mRNA	ENSG00000122420	mRNA	1	0	0
ENSG00000168676	mRNA	ENSG00000245532	lncRNA	0.985611	0.000309	0.008045
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ENSG00000168676	mRNA	ENSG00000039068	mRNA	0.985611	0.000309	0.008045
ENSG00000168676	mRNA	ENSG00000008517	mRNA	0.985611	0.000309	0.008045
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ENSG00000168676	mRNA	ENSG00000265185	lncRNA	-0.985611	0.000309	0.008045
ENSG00000168676	mRNA	ENSG00000187957	mRNA	0.985611	0.000309	0.008045
ENSG00000168676	mRNA	ENSG00000162645	mRNA	0.970588	0.001285	0.032602
ENSG00000168676	mRNA	ENSG00000254815	lncRNA	0.985611	0.000309	0.008045
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ENSG00000168676	mRNA	ENSG00000156687	mRNA	0.970588	0.001285	0.032602
ENSG00000168676	mRNA	ENSG00000101115	mRNA	0.985611	0.000309	0.008045
ENSG00000168676	mRNA	ENSG00000109072	mRNA	0.985611	0.000309	0.008045
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ENSG00000168676	mRNA	ENSG00000226416	lncRNA	0.985611	0.000309	0.008045
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ENSG00000118898	mRNA	MSTRG.13291	mRNA	-0.985611	0.000309	0.008045
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ENSG00000118898	mRNA	ENSG00000160886	mRNA	-0.942857	0.004805	0.039507
ENSG00000118898	mRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
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ENSG00000118898	mRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
ENSG00000118898	mRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000118898	mRNA	ENSG00000101197	mRNA	1	0	0
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ENSG00000118898	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
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ENSG00000100867	mRNA	ENSG00000137878	mRNA	0.942857	0.004805	0.039507
ENSG00000100867	mRNA	ENSG00000123843	mRNA	-0.942857	0.004805	0.039507

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ENSG00000100867	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
ENSG00000100867	mRNA	ENSG00000122420	mRNA	1	0	0
ENSG00000235852	lncRNA	ENSG00000166920	mRNA	-0.942857	0.004805	0.039507
ENSG00000235852	lncRNA	ENSG00000085831	mRNA	-1	0	0
ENSG00000235852	lncRNA	ENSG00000287275	lncRNA	-0.942857	0.004805	0.039507
ENSG00000235852	lncRNA	ENSG00000107731	mRNA	0.942857	0.004805	0.039507
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ENSG00000250708	lncRNA	ENSG00000264940	lncRNA	-0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000166922	mRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000263590	lncRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	MSTRG.34348	lncRNA	-0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000243244	mRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000185168	lncRNA	1	0	0
ENSG00000250708	lncRNA	ENSG00000023445	mRNA	-1	0	0
ENSG00000250708	lncRNA	ENSG00000164078	mRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000173531	mRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000134339	mRNA	0.985611	0.000309	0.008045
ENSG00000250708	lncRNA	ENSG00000248479	lncRNA	0.942857	0.004805	0.039507
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ENSG00000250708	lncRNA	ENSG00000119508	mRNA	-0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000221571	lncRNA	-1	0	0
ENSG00000250708	lncRNA	ENSG00000129946	mRNA	0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000269888	lncRNA	-0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000176692	mRNA	-0.942857	0.004805	0.039507
ENSG00000250708	lncRNA	ENSG00000163131	mRNA	0.942857	0.004805	0.039507
MSTRG.13291	mRNA	ENSG00000214353	lncRNA	-0.955882	0.002877	0.039507
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MSTRG.13291	mRNA	ENSG00000162645	mRNA	-0.970588	0.001285	0.032602
MSTRG.13291	mRNA	ENSG00000104888	mRNA	-0.955882	0.002877	0.039507
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ENSG00000214353	lncRNA	ENSG00000240219	lncRNA	0.985611	0.000309	0.008045
ENSG00000214353	lncRNA	ENSG00000162645	mRNA	0.970588	0.001285	0.032602
ENSG00000214353	lncRNA	ENSG00000104888	mRNA	1	0	0
ENSG00000214353	lncRNA	ENSG00000156687	mRNA	0.970588	0.001285	0.032602
ENSG00000214353	lncRNA	ENSG00000101197	mRNA	0.985611	0.000309	0.008045
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ENSG00000264940	lncRNA	ENSG00000269888	lncRNA	1	0	0
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ENSG00000264940	lncRNA	ENSG00000137965	mRNA	-0.942857	0.004805	0.039507
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ENSG00000166922	mRNA	ENSG00000248479	lncRNA	1	0	0
ENSG00000166922	mRNA	ENSG00000162804	mRNA	1	0	0
ENSG00000166922	mRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
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ENSG00000166922	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000166922	mRNA	ENSG00000163131	mRNA	1	0	0
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ENSG00000166920	mRNA	ENSG00000085831	mRNA	0.942857	0.004805	0.039507
ENSG00000166920	mRNA	ENSG00000168477	mRNA	0.942857	0.004805	0.039507
ENSG00000166920	mRNA	ENSG00000107821	mRNA	0.942857	0.004805	0.039507
ENSG00000166920	mRNA	ENSG00000131409	mRNA	0.985611	0.000309	0.008045
ENSG00000166920	mRNA	ENSG00000276600	mRNA	0.942857	0.004805	0.039507
ENSG00000166920	mRNA	ENSG00000272114	lncRNA	0.942857	0.004805	0.039507
ENSG00000166924	mRNA	ENSG00000287275	lncRNA	0.942857	0.004805	0.039507
ENSG00000166924	mRNA	ENSG00000107731	mRNA	-0.942857	0.004805	0.039507
ENSG00000166924	mRNA	ENSG00000261080	lncRNA	0.942857	0.004805	0.039507
ENSG00000166924	mRNA	ENSG00000159753	mRNA	-0.942857	0.004805	0.039507
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ENSG00000166924	mRNA	ENSG00000163435	mRNA	0.942857	0.004805	0.039507
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MSTRG.22782	mRNA	ENSG00000168477	mRNA	0.942857	0.004805	0.039507
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ENSG00000245532	lncRNA	ENSG00000258479	lncRNA	0.942857	0.004805	0.039507
ENSG00000245532	lncRNA	ENSG00000089127	mRNA	0.942857	0.004805	0.039507
ENSG00000245532	lncRNA	ENSG00000074370	mRNA	0.985611	0.000309	0.008045
ENSG00000245532	lncRNA	ENSG00000039068	mRNA	1	0	0
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ENSG00000245532	lncRNA	ENSG00000179148	mRNA	0.942857	0.004805	0.039507
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ENSG00000245532	lncRNA	ENSG00000187957	mRNA	1	0	0
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ENSG00000245532	lncRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
ENSG00000245532	lncRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
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ENSG00000258479	lncRNA	ENSG00000275638	lncRNA	0.942857	0.004805	0.039507
ENSG00000258479	lncRNA	ENSG00000107242	mRNA	-0.942857	0.004805	0.039507
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ENSG00000258479	lncRNA	ENSG00000187957	mRNA	0.942857	0.004805	0.039507
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ENSG00000258479	lncRNA	ENSG00000269888	lncRNA	-0.942857	0.004805	0.039507
ENSG00000258479	lncRNA	ENSG00000148677	mRNA	-0.942857	0.004805	0.039507
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ENSG00000130827	mRNA	ENSG00000275638	lncRNA	0.942857	0.004805	0.039507
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ENSG00000130827	mRNA	MSTRG.5832	mRNA	-0.942857	0.004805	0.039507
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ENSG00000107159	mRNA	ENSG00000265972	mRNA	0.985611	0.000309	0.008045
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ENSG00000080031	mRNA	ENSG00000275638	lncRNA	0.942857	0.004805	0.039507
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ENSG00000080031	mRNA	ENSG00000116032	mRNA	0.942857	0.004805	0.039507
ENSG00000080031	mRNA	MSTRG.5832	mRNA	-0.942857	0.004805	0.039507
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ENSG00000080031	mRNA	ENSG00000100027	mRNA	1	0	0
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ENSG00000231324	lncRNA	ENSG00000269028	mRNA	-1	0	0
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ENSG00000089127	mRNA	ENSG00000039068	mRNA	0.942857	0.004805	0.039507
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ENSG00000089127	mRNA	ENSG00000259803	mRNA	1	0	0
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ENSG00000089127	mRNA	ENSG00000229921	lncRNA	1	0	0
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ENSG00000243244	mRNA	ENSG00000287275	lncRNA	0.942857	0.004805	0.039507
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ENSG00000243244	mRNA	ENSG00000129946	mRNA	1	0	0
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ENSG00000185168	lncRNA	ENSG00000221571	lncRNA	-1	0	0
ENSG00000185168	lncRNA	ENSG00000129946	mRNA	0.942857	0.004805	0.039507
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ENSG00000039068	mRNA	ENSG00000265185	lncRNA	-0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000240219	lncRNA	0.942857	0.004805	0.039507
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ENSG00000039068	mRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
ENSG00000039068	mRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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ENSG00000039068	mRNA	ENSG00000091262	mRNA	1	0	0
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ENSG00000039068	mRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000279954	lncRNA	0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000101115	mRNA	1	0	0
ENSG00000039068	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000109072	mRNA	1	0	0
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ENSG00000039068	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000039068	mRNA	ENSG00000140009	mRNA	1	0	0
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ENSG00000275638	lncRNA	ENSG00000240764	mRNA	0.942857	0.004805	0.039507
ENSG00000275638	lncRNA	ENSG00000255182	lncRNA	0.942857	0.004805	0.039507
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ENSG00000275638	lncRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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ENSG00000275638	lncRNA	ENSG00000237892	lncRNA	0.942857	0.004805	0.039507
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ENSG00000196189	mRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
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ENSG00000265972	mRNA	ENSG00000240219	lncRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000253317	lncRNA	1	0	0
ENSG00000265972	mRNA	ENSG00000149809	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000183691	mRNA	-0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000142619	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000047457	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000102359	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000265972	mRNA	ENSG00000179111	mRNA	1	0	0
ENSG00000265972	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000164078	mRNA	ENSG00000173531	mRNA	1	0	0
ENSG00000164078	mRNA	ENSG00000119508	mRNA	-1	0	0
ENSG00000164078	mRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
ENSG00000164078	mRNA	ENSG00000007516	mRNA	0.942857	0.004805	0.039507
ENSG00000164078	mRNA	ENSG00000176692	mRNA	-1	0	0
ENSG00000287046	lncRNA	ENSG00000010295	mRNA	0.983739	0.000394	0.010254
ENSG00000265185	lncRNA	ENSG00000187957	mRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000254815	lncRNA	-1	0	0
ENSG00000265185	lncRNA	ENSG00000101198	mRNA	-1	0	0
ENSG00000265185	lncRNA	ENSG00000091262	mRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000101115	mRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000123843	mRNA	0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000109072	mRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000269888	lncRNA	0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000148677	mRNA	0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000140009	mRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000226416	lncRNA	-0.942857	0.004805	0.039507
ENSG00000265185	lncRNA	ENSG00000197558	mRNA	-1	0	0
ENSG00000240219	lncRNA	ENSG00000187957	mRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000275620	lncRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000253317	lncRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000160886	mRNA	-0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
ENSG00000240219	lncRNA	ENSG00000104888	mRNA	0.985611	0.000309	0.008045
ENSG00000240219	lncRNA	ENSG00000091262	mRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
ENSG00000240219	lncRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000101197	mRNA	1	0	0
ENSG00000240219	lncRNA	ENSG00000123843	mRNA	-0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
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ENSG00000240219	lncRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
ENSG00000240219	lncRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
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ENSG00000187957	mRNA	ENSG00000162645	mRNA	0.985611	0.000309	0.008045
ENSG00000187957	mRNA	ENSG00000254815	lncRNA	0.942857	0.004805	0.039507
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ENSG00000187957	mRNA	ENSG00000101115	mRNA	1	0	0
ENSG00000187957	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000187957	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507

ENSG00000187957	mRNA	ENSG00000109072	mRNA	1	0	0
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ENSG00000187957	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000187957	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000187957	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000187957	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
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ENSG00000107821	mRNA	ENSG00000259803	mRNA	0.942857	0.004805	0.039507
ENSG00000107821	mRNA	ENSG00000229921	lncRNA	0.942857	0.004805	0.039507
ENSG00000107821	mRNA	ENSG00000279954	lncRNA	0.942857	0.004805	0.039507
ENSG00000107821	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
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ENSG00000107821	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
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ENSG00000240764	mRNA	ENSG00000237892	lncRNA	1	0	0
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ENSG00000240764	mRNA	ENSG00000125895	mRNA	0.942857	0.004805	0.039507
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ENSG00000266714	mRNA	ENSG00000142619	mRNA	0.942857	0.004805	0.039507
ENSG00000266714	mRNA	ENSG00000237892	lncRNA	0.942857	0.004805	0.039507
ENSG00000266714	mRNA	ENSG00000145020	mRNA	1	0	0
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ENSG00000266714	mRNA	ENSG00000105559	mRNA	1	0	0
ENSG00000266714	mRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000266714	mRNA	ENSG00000090238	mRNA	1	0	0
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ENSG00000261080	lncRNA	ENSG00000163435	mRNA	1	0	0
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ENSG00000275620	lncRNA	ENSG00000149809	mRNA	0.942857	0.004805	0.039507
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ENSG00000275620	lncRNA	ENSG00000283761	mRNA	0.942857	0.004805	0.039507
ENSG00000275620	lncRNA	ENSG00000047457	mRNA	0.942857	0.004805	0.039507
ENSG00000275620	lncRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000275620	lncRNA	ENSG00000007516	mRNA	0.942857	0.004805	0.039507
ENSG00000275620	lncRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
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ENSG00000275620	lncRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
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ENSG00000253317	lncRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000253317	lncRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000253317	lncRNA	ENSG00000179111	mRNA	1	0	0
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ENSG00000173531	mRNA	ENSG00000119508	mRNA	-1	0	0
ENSG00000173531	mRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
ENSG00000173531	mRNA	ENSG00000007516	mRNA	0.942857	0.004805	0.039507
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ENSG00000134339	mRNA	ENSG00000221571	lncRNA	-0.985611	0.000309	0.008045
ENSG00000134339	mRNA	ENSG00000129946	mRNA	0.985611	0.000309	0.008045
ENSG00000149809	mRNA	ENSG00000160886	mRNA	-0.942857	0.004805	0.039507
ENSG00000149809	mRNA	ENSG0000047457	mRNA	1	0	0
ENSG00000149809	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
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ENSG00000248479	lncRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000248479	lncRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000248479	lncRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
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ENSG00000160886	mRNA	MSTRG.32594	lncRNA	-0.942857	0.004805	0.039507
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ENSG00000259803	mRNA	ENSG00000229921	lncRNA	1	0	0
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ENSG00000259803	mRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
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ENSG00000259803	mRNA	ENSG00000272114	lncRNA	0.942857	0.004805	0.039507
ENSG00000259803	mRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
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ENSG00000162645	mRNA	ENSG00000091262	mRNA	0.985611	0.000309	0.008045
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ENSG00000162645	mRNA	ENSG00000101197	mRNA	0.985611	0.000309	0.008045
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ENSG00000120693	mRNA	ENSG00000145020	mRNA	-0.942857	0.004805	0.039507
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ENSG00000120693	mRNA	ENSG00000137878	mRNA	-0.942857	0.004805	0.039507
ENSG00000120693	mRNA	ENSG00000105559	mRNA	-0.942857	0.004805	0.039507
ENSG00000120693	mRNA	ENSG00000090238	mRNA	-0.942857	0.004805	0.039507
ENSG00000104888	mRNA	ENSG00000156687	mRNA	0.970588	0.001285	0.032602
ENSG00000104888	mRNA	ENSG00000101197	mRNA	0.985611	0.000309	0.008045
ENSG00000104888	mRNA	ENSG00000123843	mRNA	-0.985611	0.000309	0.008045
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ENSG00000254815	lncRNA	ENSG00000101198	mRNA	1	0	0

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ENSG00000254815	lncRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
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ENSG00000254815	lncRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000254815	lncRNA	ENSG00000197558	mRNA	1	0	0
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ENSG00000101198	mRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
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ENSG00000142619	mRNA	ENSG00000145020	mRNA	0.942857	0.004805	0.039507
ENSG00000142619	mRNA	ENSG00000137878	mRNA	0.942857	0.004805	0.039507
ENSG00000142619	mRNA	ENSG00000123843	mRNA	-0.942857	0.004805	0.039507
ENSG00000142619	mRNA	ENSG00000105559	mRNA	0.942857	0.004805	0.039507
ENSG00000142619	mRNA	ENSG00000158825	mRNA	1	0	0
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ENSG00000142619	mRNA	ENSG00000122420	mRNA	1	0	0
ENSG00000091262	mRNA	ENSG00000156687	mRNA	0.985611	0.000309	0.008045
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ENSG00000091262	mRNA	ENSG00000101115	mRNA	1	0	0
ENSG00000091262	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000091262	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000091262	mRNA	ENSG00000109072	mRNA	1	0	0
ENSG00000091262	mRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000091262	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000091262	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000091262	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000091262	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000047457	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
ENSG00000163435	mRNA	ENSG00000267740	mRNA	-1	0	0
ENSG00000163435	mRNA	ENSG00000276600	mRNA	0.942857	0.004805	0.039507
ENSG00000237892	lncRNA	ENSG00000145020	mRNA	0.942857	0.004805	0.039507
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ENSG00000156687	mRNA	ENSG00000140009	mRNA	0.985611	0.000309	0.008045
ENSG00000156687	mRNA	ENSG00000226416	lncRNA	0.985611	0.000309	0.008045
ENSG00000145020	mRNA	ENSG00000137878	mRNA	1	0	0
ENSG00000145020	mRNA	ENSG00000102359	mRNA	0.942857	0.004805	0.039507
ENSG00000145020	mRNA	ENSG00000105559	mRNA	1	0	0
ENSG00000145020	mRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000145020	mRNA	ENSG00000090238	mRNA	1	0	0
ENSG00000145020	mRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000145020	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000145020	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507

ENSG00000162804	mRNA	ENSG00000221571	lncRNA	-0.942857	0.004805	0.039507
ENSG00000162804	mRNA	ENSG00000007516	mRNA	0.942857	0.004805	0.039507
ENSG00000162804	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000162804	mRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000162804	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000162804	mRNA	ENSG00000163131	mRNA	1	0	0
ENSG00000119508	mRNA	ENSG00000221571	lncRNA	0.942857	0.004805	0.039507
ENSG00000119508	mRNA	ENSG00000007516	mRNA	-0.942857	0.004805	0.039507
ENSG00000119508	mRNA	ENSG00000176692	mRNA	1	0	0
ENSG00000229921	lncRNA	ENSG00000279954	lncRNA	1	0	0
ENSG00000229921	lncRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000229921	lncRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
ENSG00000229921	lncRNA	ENSG00000140009	mRNA	0.942857	0.004805	0.039507
ENSG00000229921	lncRNA	ENSG00000272114	lncRNA	0.942857	0.004805	0.039507
ENSG00000229921	lncRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000279954	lncRNA	ENSG00000101115	mRNA	0.942857	0.004805	0.039507
ENSG00000279954	lncRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
ENSG00000279954	lncRNA	ENSG00000140009	mRNA	0.942857	0.004805	0.039507
ENSG00000279954	lncRNA	ENSG00000272114	lncRNA	0.942857	0.004805	0.039507
ENSG00000279954	lncRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000221571	lncRNA	ENSG00000129946	mRNA	-0.942857	0.004805	0.039507
ENSG00000221571	lncRNA	ENSG00000269888	lncRNA	0.942857	0.004805	0.039507
ENSG00000221571	lncRNA	ENSG00000176692	mRNA	0.942857	0.004805	0.039507
ENSG00000221571	lncRNA	ENSG00000163131	mRNA	-0.942857	0.004805	0.039507
ENSG00000101115	mRNA	ENSG00000101197	mRNA	0.942857	0.004805	0.039507
ENSG00000101115	mRNA	ENSG00000114315	mRNA	-0.942857	0.004805	0.039507
ENSG00000101115	mRNA	ENSG00000109072	mRNA	1	0	0
ENSG00000101115	mRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000101115	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000101115	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000101115	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000101115	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000125895	mRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
ENSG00000125895	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000125895	mRNA	ENSG00000137965	mRNA	0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000123843	mRNA	-0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000109072	mRNA	0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000148677	mRNA	-0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000140009	mRNA	0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
ENSG00000101197	mRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000137878	mRNA	ENSG00000102359	mRNA	0.942857	0.004805	0.039507
ENSG00000137878	mRNA	ENSG00000105559	mRNA	1	0	0
ENSG00000137878	mRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000137878	mRNA	ENSG00000090238	mRNA	1	0	0
ENSG00000137878	mRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000137878	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000137878	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000267740	mRNA	ENSG00000276600	mRNA	-0.942857	0.004805	0.039507
ENSG00000007516	mRNA	ENSG00000176692	mRNA	-0.942857	0.004805	0.039507
ENSG00000007516	mRNA	ENSG00000163131	mRNA	0.942857	0.004805	0.039507
ENSG00000114315	mRNA	ENSG00000109072	mRNA	-0.942857	0.004805	0.039507
ENSG00000114315	mRNA	ENSG00000125398	mRNA	1	0	0
ENSG00000114315	mRNA	MSTRG.32594	lncRNA	-1	0	0
ENSG00000114315	mRNA	ENSG00000140009	mRNA	-0.942857	0.004805	0.039507
ENSG00000114315	mRNA	ENSG00000163131	mRNA	-0.942857	0.004805	0.039507
ENSG00000114315	mRNA	ENSG00000272114	lncRNA	-0.942857	0.004805	0.039507
ENSG00000114315	mRNA	ENSG00000226416	lncRNA	-0.942857	0.004805	0.039507
ENSG00000102359	mRNA	ENSG00000105559	mRNA	0.942857	0.004805	0.039507
ENSG00000102359	mRNA	ENSG00000090238	mRNA	0.942857	0.004805	0.039507
ENSG00000102359	mRNA	ENSG00000100342	mRNA	1	0	0

ENSG00000102359	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
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ENSG00000123843	mRNA	ENSG00000148677	mRNA	1	0	0
ENSG00000123843	mRNA	ENSG00000122420	mRNA	-0.942857	0.004805	0.039507
ENSG00000123843	mRNA	ENSG00000197558	mRNA	-0.942857	0.004805	0.039507
ENSG00000105559	mRNA	ENSG00000158825	mRNA	0.942857	0.004805	0.039507
ENSG00000105559	mRNA	ENSG00000090238	mRNA	1	0	0
ENSG00000105559	mRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000105559	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000105559	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000158825	mRNA	ENSG00000090238	mRNA	0.942857	0.004805	0.039507
ENSG00000158825	mRNA	ENSG00000148677	mRNA	-0.942857	0.004805	0.039507
ENSG00000158825	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
ENSG00000158825	mRNA	ENSG00000122420	mRNA	1	0	0
ENSG00000090238	mRNA	ENSG00000100342	mRNA	0.942857	0.004805	0.039507
ENSG00000090238	mRNA	ENSG00000197249	mRNA	0.942857	0.004805	0.039507
ENSG00000090238	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000109072	mRNA	ENSG00000125398	mRNA	-0.942857	0.004805	0.039507
ENSG00000109072	mRNA	MSTRG.32594	lncRNA	0.942857	0.004805	0.039507
ENSG00000109072	mRNA	ENSG00000140009	mRNA	1	0	0
ENSG00000109072	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000109072	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000129946	mRNA	ENSG00000100027	mRNA	0.942857	0.004805	0.039507
ENSG00000129946	mRNA	ENSG00000137965	mRNA	0.942857	0.004805	0.039507
ENSG00000125398	mRNA	MSTRG.32594	lncRNA	-1	0	0
ENSG00000125398	mRNA	ENSG00000140009	mRNA	-0.942857	0.004805	0.039507
ENSG00000125398	mRNA	ENSG00000163131	mRNA	-0.942857	0.004805	0.039507
ENSG00000125398	mRNA	ENSG00000272114	lncRNA	-0.942857	0.004805	0.039507
ENSG00000125398	mRNA	ENSG00000226416	lncRNA	-0.942857	0.004805	0.039507
ENSG00000269888	lncRNA	ENSG00000100027	mRNA	-0.942857	0.004805	0.039507
ENSG00000269888	lncRNA	ENSG00000137965	mRNA	-0.942857	0.004805	0.039507
ENSG00000269888	lncRNA	ENSG00000197558	mRNA	-0.942857	0.004805	0.039507
ENSG00000100342	mRNA	ENSG00000179111	mRNA	0.942857	0.004805	0.039507
MSTRG.32594	lncRNA	ENSG00000140009	mRNA	0.942857	0.004805	0.039507
MSTRG.32594	lncRNA	ENSG00000163131	mRNA	0.942857	0.004805	0.039507
MSTRG.32594	lncRNA	ENSG00000272114	lncRNA	0.942857	0.004805	0.039507
MSTRG.32594	lncRNA	ENSG00000226416	lncRNA	0.942857	0.004805	0.039507
ENSG00000148677	mRNA	ENSG00000122420	mRNA	-0.942857	0.004805	0.039507
ENSG00000148677	mRNA	ENSG00000197558	mRNA	-0.942857	0.004805	0.039507
ENSG00000140009	mRNA	ENSG00000226416	lncRNA	1	0	0
ENSG00000140009	mRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507
ENSG00000100027	mRNA	ENSG00000137965	mRNA	1	0	0
ENSG00000179111	mRNA	ENSG00000122420	mRNA	0.942857	0.004805	0.039507
ENSG00000226416	lncRNA	ENSG00000197558	mRNA	0.942857	0.004805	0.039507

verify the RNA-seq results, qRT-PCR analysis was used to measure the expression of ENST00000538717 in a phycocyanin-treated NSCLC cell model. As shown in Figure 4B, the relative expression of LncRNA s was significantly downregulated after phycocyanin exposure in both H460 and A549 cells, suggesting that the sequencing results are highly reliable. To further estimate whether the ectopic expression of ENST00000538717 affects the growth and migration of NSCLC cells, cell survival and wound healing assays were employed. Figure 4C and 4D show that suppressing the expression of ENST00000538717 could significantly decrease the viability and migration in both A549 and H460 cells. Altogether, the results revealed that ENST00000538717 might be a candidate regulator in phycocyanin-mediated inhibition of NSCLC cell viability.

Increasing evidence has suggested that LncRNA s could be important prognostic factors for tumors, including lung cancer [18,25,26]. Zhang et al. reported that LncRNA TUC338 was overexpressed in lung cancer

and promoted the invasion of lung cancer through the MAPK pathway [27]. In addition, LncRNA s could also act as cancer suppressor genes in NSCLC through LncRNA-LncRNA interactions [28]. In the current work, a total of 309 LncRNA s, including 116 downregulated and 193 upregulated LncRNA s, exhibited significant expression differences between the Con and PC groups. LncRNA ENST00000538717 was chosen to verify the LncRNA-seq results, and its expression was downregulated after phycocyanin treatment, indicating that it is an inhibitory factor in NSCLC cells. Interestingly, ENST00000538717 performs different functions in different types of tumors. Yi et al. reported that overexpression of LINC00852 promotes prostate cancer cell proliferation and metastasis [29]. However, our results revealed that ENST00000538717 impaired the viability and migration of NSCLC cells, which was consistent with Tuo's study [30]. The data suggested that this LncRNA s may be novel regulatory factors of phycocyanin in NSCLC cells, and the precise functions of LncRNA s remain under

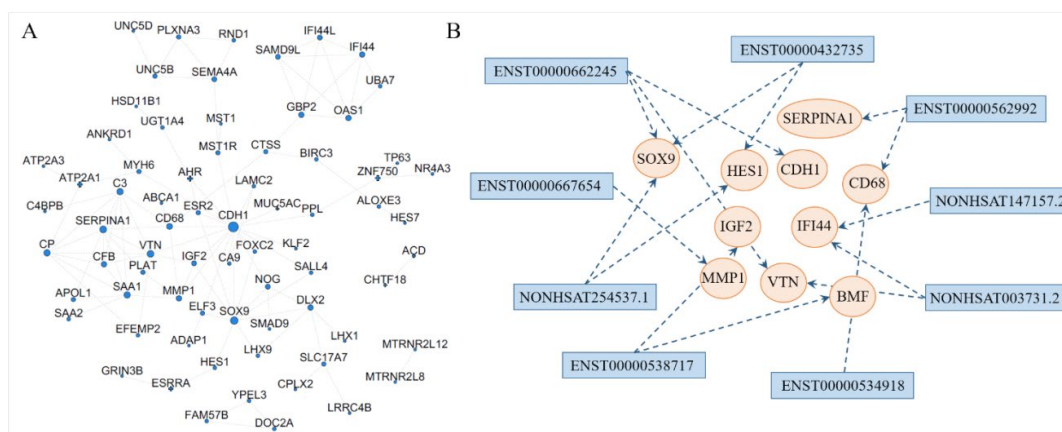


further investigation.

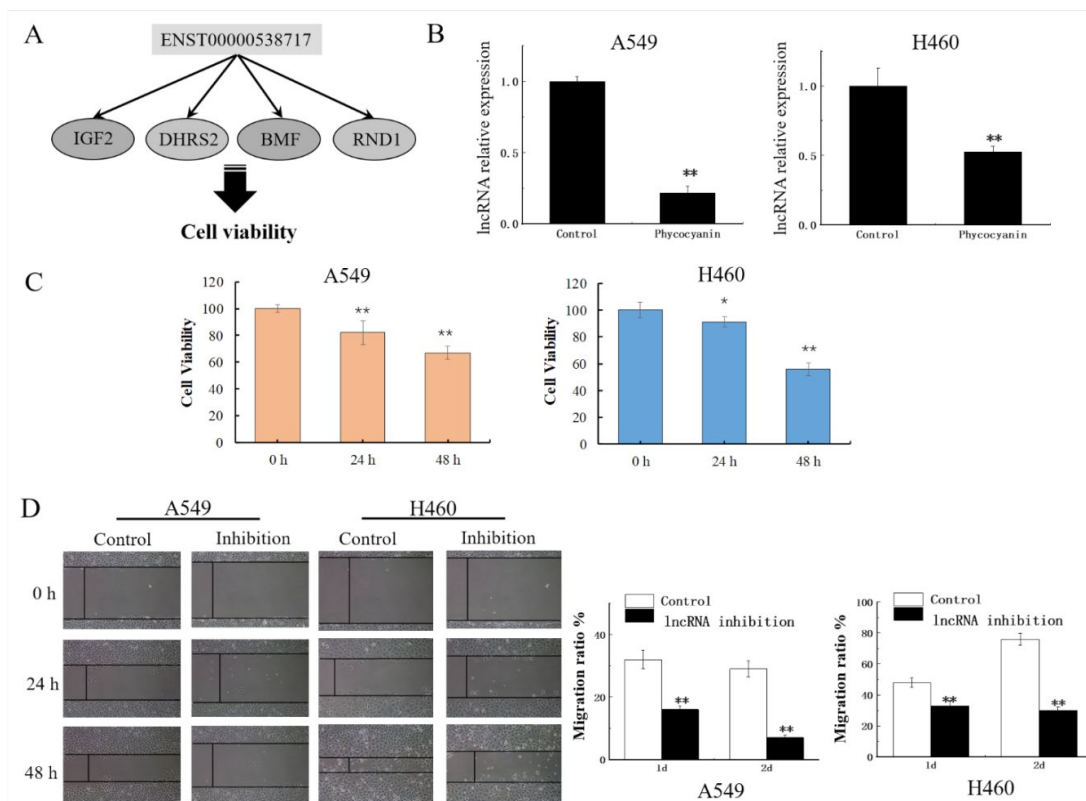
In summary, the present work systematically identified the changes in LncRNA s during the process of phycocyanin-mediated inhibition of NSCLC cell activity and further characterized these changes through bioinformatic analyses. A key differential LncRNA was screened and verified, and phycocyanin was found to decrease the activity of NSCLC cells in vitro by inhibiting this LncRNA. Nowadays, competing endogenous RNAs (ceRNAs) hypothesis has become an important research field in the study of cell life activity and tumor regulation [31]. Studies have shown that the LncRNA-mRNA regulatory network

is involved in the regulation of various tumor cells [31-33]. As a result, functional study of specific LncRNA in cancer cells has certain limitations. The combination of LncRNA-mRNA network with cell phenotype is the key research direction of ceRNAs. Meanwhile, beside LncRNA, ceRNAs including cirRNA, pseudogene, competing miRNA can also interfere with expression of target mRNAs [34]. Therefore, further explorations are urgently needed to dig out the deep anti-tumor mechanism of phycocyanin, which is also the topic of our future research.

### Conclusion



**Figure 3:** The lncRNA-mRNA, and target gene co-expression network. (A) Interaction network of DE lncRNA targets. (B) The lncRNA-mRNA interaction pairs with high positive correlation coefficient.



**Figure 4:** Validation and functional assays of lncRNA ENST00000538717 in NSCLC cells. (A) The target prediction and GO analysis indicate that lncRNA ENST00000538717 are related to multiple genes and cell viability. (B) qRT-PCR validation of RNA-sequencing expression result of lncRNA ENST00000538717 in A549 and H460 cells. (C) Cell survival analysis of A549 and H460 cells after ENST00000538717 inhibition. (D) Cell migration analysis of A549 and H460 cells after ENST00000538717 inhibition. \*,  $p < 0.05$ , \*\*,  $p < 0.01$ .

In this study, differentially expressed LncRNAs and target genes were discovered, and they are involved in cell viability, apoptosis, migration and corresponding signaling pathways. Moreover, the LncRNA-mRNA interaction network provided a novel regulatory pattern, which showed potential molecular targets of phycocyanin, molecular therapeutic factors and prognostic markers of NSCLC. Most notably, 72 significant gene nodes were discovered in the target gene interaction network, which are tightly associated with the antineoplastic mechanism of phycocyanin in NSCLC. The results may provide a new strategy for further investigation of antitumor targets and the regulatory process of phycocyanin in NSCLC.

### Supplementary materials

Table S1. Statistics of LncRNAs

Table S2. Classification and subgroup of LncRNAs

Table S3. The top expressed 15 LncRNA transcripts in Con and PC groups

Table S4. Detailed information of DE LncRNAs

Table S5. Top 10 downregulated and 10 upregulated LncRNA transcripts

Table S6. Detailed information for potential targets of DE LncRNAs

Table S7. Detailed information of LncRNA-mRNA co-expression network

Figure S1. LncRNA-mRNA co-expression networks.

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### Author Contributions

Conceptualization, Shuai Hao; Funding acquisition, Shuai Hao; Investigation, Boxiong Wu, Haozhe Cheng, Xinran Li and Wenjing Zhang; Methodology, Boxiong Wu and Shuai Hao; Resources, Shuai Hao; Supervision, Shuai Hao; Validation, Boxiong Wu, Haozhe Cheng and Xinran Li; Writing-original draft, Shuai Hao.

### Conflicts of Interest

The authors declare no conflict of interest.

### Institutional Review Board Statement

Not applicable.

### Data Availability Statement

The data are available upon request from the corresponding author (haoshuai@btbu.edu.cn).

### Informed Consent Statement

Not applicable.

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