

SUPPLEMENTAL DIGITAL CONTENT (SDC)

SDC, MATERIALS AND METHODS

Animals

This study used 9-12 week old male C57BL/6 mice (Jackson Laboratory, Bar Harbor, ME). This study conformed to the National Institutes of Health guidelines and was conducted under animal protocols approved by the University of Virginia's Institutional Animal Care and Use Committee.

Murine DCD Lung Procedure

Mice were anesthetized by isoflurane inhalation and euthanized by cervical dislocation followed by a 60-minute period of "no-touch" warm ischemia. Mice then underwent extended median sternotomy and midline cervical exposure followed by intubation for the initiation of mechanical ventilation at 120 strokes/minute with room air. The left atrium was vented via an atriotomy followed by infusion of the lungs with 3 mL 4°C Perfadex® solution (Vitrolife Inc., Denver, CO) supplemented with THAM Solution (Vitrolife, Kungsbacka, Sweden), estimating weight-based volume recommendations for pulmonary artery perfusion (140mL/kg) (1). The chest was then packed with ice and the trachea occluded by silk-suture tie at tidal volume (7 μ L/g body weight) prior to cold static preservation (CSP) for 60 minutes at 4°C. Mice were then randomized into three experimental groups: 1) CSP alone with no EVLP, 2) EVLP with Steen solution and 3) EVLP with Steen solution supplemented with the highly selective A_{2A}R agonist, ATL1223 (30nM, Lewis and Clark Pharmaceuticals, Charlottesville, VA). Mice treated with ATL1223 during EVLP also received ATL1223 treatment (30nM) during the Perfadex flush prior to CSP whereas the EVLP group received vehicle (DMSO) during the flush. CSP lungs, which did not undergo EVLP, underwent immediate functional assessment after re-intubation as described below.

Murine EVLP

A diagram of the EVLP system is shown in Figure 1. For the two groups that underwent EVLP, a tracheostomy was performed, and lungs were ventilated in the chest with room air (100 strokes/minute, tidal volume = 7 μ l/g body weight, 2 cm H₂O PEEP). Following a right ventriculotomy, the pulmonary artery was cannulated for placement onto a murine isolated, lung perfusion apparatus (Hugo Sachs Elektronik, March-Huggstetten, Germany) as previously described (2). The left atrium was cannulated for drainage of the perfusate. The lungs were perfused with Steen solution at a constant rate of 60 μ l/g body weight/minute, an established standard for isolated murine lung perfusion (3, 4). Steen solution within the circuit was gradually

warmed from 4°C to 37°C through the circuit water bath, and EVLP continued for 60 minutes. Steen solution was supplemented with 10,000 IU heparin, 500mg cefazolin and 500mg methylprednisolone per 1500mL, modeling preclinical and clinical EVLP protocols (5, 6). Steen solution was also supplemented with vehicle (DMSO) for the EVLP group or with ATL1223 (30nM) for the ATL1223-treated group.

Lung Function

Pulmonary function and hemodynamic measurements (pulmonary artery pressure and pulmonary compliance) were recorded at the end of 60 minutes of perfusion using the PULMODYN data acquisition system (Hugo Sachs Elektronik). To measure lung function of the CSP group, lungs were placed directly on the isolated lung perfusion apparatus and perfused with standard Krebs-Henseleit buffer for a 5-minute equilibration period before data was recorded for an additional 5 minutes as previously described (4). These CSP lungs were utilized to obtain the data shown in Figures 2-6. A separate group of CSP lungs were perfused with Krebs-Henseleit buffer for one hour and compared to the EVLP and EVLP+ATL1223 groups in order to assess temporal changes in function during perfusion (see SDC Figure 1).

Cytokine Measurements

Using separate groups of animals, proinflammatory cytokines were measured in whole lung lysates. Fresh lungs were snap-frozen in liquid nitrogen and preserved at -80°C. Lungs were homogenized using Lysing Matrix D tissue grinding tubes (MP Biomedicals, Solon, OH) as instructed. Protein concentrations were calculated using a Bicinchoninic Acid Protein Assay Kit (Thermo Scientific, Rockford, IL). Cytokine levels were then quantified in samples (containing equal protein levels) using the Bioplex Bead Array technique via a multiplex cytokine panel assay (Bio-Rad Laboratories, Hercules, CA) as described previously (4, 7) and presented as pg/ml concentrations.

Neutrophil Counts

Using lungs from separate groups of animals, neutrophil counts in lung sections were performed as described previously (4). The left lungs were isolated and fixed by endotracheal instillation of formalin at 10cm H₂O. The trachea was then tied and lungs preserved at 4°C for 24 hours prior to paraffin embedding. Neutrophil immunostaining of lung sections was performed using a rat anti-mouse neutrophil primary antibody (GR1.1, Santa Cruz, Biotechnology) and alkaline phosphatase-conjugated anti-rat IgG secondary antibody with the Vectastain ABC kit (Vector

Laboratories, Burlingame, CA). Purified normal rat immunoglobulin G (eBioscience Inc., San Diego, CA) served as the negative control, and sections were counterstained with hematoxylin. Three standardized high-powered fields (20x magnification) from each section (1 section/mouse) were used for neutrophil counting in peripheral lung tissue by a blinded investigator. The calculated mean of the three values for each mouse was utilized to compare neutrophil numbers per high-powered field.

Lung Wet/Dry Weight

Right lungs were weighed and placed in a vacuum oven at 54°C until a stable dry weight was achieved. The lung wet/dry weight ratio was then calculated as an indicator of pulmonary edema.

Statistical Analysis

Statistical analyses were performed using GraphPad Prism 6.0 software, and data are presented as the mean \pm standard error of the mean. One-way ANOVA with post-hoc Bonferroni's multiple comparisons, Mann-Whitney U-test, or Student's t-test were used as appropriate to compare experimental groups. Statistical significance was set at $P < 0.05$.

RNA Isolation and Microarray Hybridization

Using separate groups of animals (n=4/group), total RNA was extracted from whole lungs using TRIzol reagent (Life technologies, Carlsbad, CA), following the Affymetrix GeneChip® Expression Analysis Manual (Affymetrix, Santa Clara, CA, USA) guidelines and recommendations. All RNA samples met purity and integrity quality control criteria previously established (8, 9). Reactions for cDNA synthesis and in vitro transcription for labeled cRNA probe, microarray hybridization, image generation, and probesets reading process were performed as reported previously (22). In total, twelve Affymetrix GeneChip Mouse Genome 430A 2.0 microarrays were hybridized for three separate groups of animals (n=4/group). After hybridization, each chip was scanned on an Affymetrix GeneChip® Scanner 3000 G7. Raw intensities for every probe were stored in electronic files (.DAT and .CEL formats) by the GeneChip® Operating Software (GCOS).

Microarray Quality Control and Data Analysis

The hybridized Affymetrix GeneChip Mouse Genome 430A 2.0 microarrays were analyzed using RMAexpress software to normalize probeset data by quantile normalization and

summarized with median polish summarization using the Robust Multiarray Average method (10, 11). Pairwise comparisons (EVLP vs. CSP and EVLP+ATL1223 vs. CSP) were fit using two-sample *t*-test in the R programming environment (12). To adjust for the multiple hypothesis tests, the *p*-values were used in estimating the false discovery rate (FDR) using the Benjamini and Hochberg method (13-15). *P*-values ≤ 0.001 under a controlled FDR < 1% were considered significant. Fold-change values were used for differential expression magnitudes.

Interaction Networks, Functional Analysis, and Upstream regulators

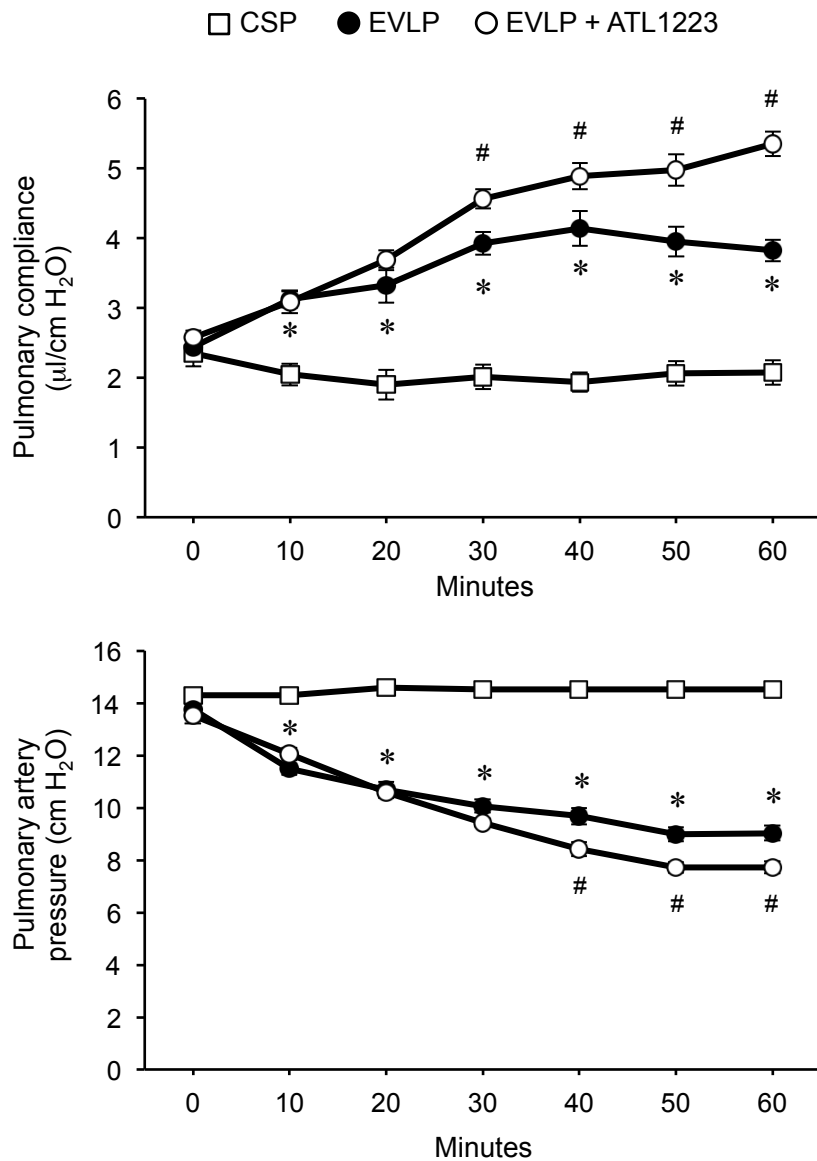
The Ingenuity Pathway Analysis (IPA, www.ingenuity.com) tool was used to analyze gene ontology and pathways of differential expressed genes. *P*-values ≤ 0.05 were considered significant. Spreadsheet lists containing probesets ID and fold-changes were generated and uploaded to IPA.

REFERENCES

1. Steen S, Kimblad PO, Sjoberg T, Lindberg L, Ingemansson R, Massa G. Safe lung preservation for twenty-four hours with Perfadex. *Ann Thorac Surg* 1994; 57: 450.
2. Sharma AK, Linden J, Kron IL, Laubach VE. Protection from pulmonary ischemia-reperfusion injury by adenosine A2A receptor activation. *Respir Res* 2009; 10: 58.
3. Zhao M, Fernandez LG, Doctor A, et al. Alveolar macrophage activation is a key initiation signal for acute lung ischemia-reperfusion injury. *Am J Physiol Lung Cell Mol Physiol* 2006; 291: L1018.
4. Yang Z, Sharma AK, Linden J, Kron IL, Laubach VE. CD4+ T lymphocytes mediate acute pulmonary ischemia-reperfusion injury. *J Thorac Cardiovasc Surg* 2009; 137: 695.
5. Mulloy DP, Stone ML, Crosby IK, et al. Ex vivo rehabilitation of non-heart-beating donor lungs in preclinical porcine model: delayed perfusion results in superior lung function. *J Thorac Cardiovasc Surg* 2012; 144: 1208.
6. Cypel M, Yeung JC, Hirayama S, et al. Technique for prolonged normothermic ex vivo lung perfusion. *J Heart Lung Transplant* 2008; 27: 1319.
7. Sharma AK, Laubach VE, Ramos SI, et al. Adenosine A2A receptor activation on CD4+ T lymphocytes and neutrophils attenuates lung ischemia-reperfusion injury. *J Thorac Cardiovasc Surg* 2010; 139: 474.

8. Gehrau RC, Archer KJ, Mas VR, Maluf DG. Molecular profiles of HCV cirrhotic tissues derived in a panel of markers with clinical utility for hepatocellular carcinoma surveillance. *PLoS One* 2012; 7: e40275.
9. Mas VR, Maluf DG, Stravitz R, et al. Hepatocellular carcinoma in HCV-infected patients awaiting liver transplantation: genes involved in tumor progression. *Liver Transpl* 2004; 10: 607.
10. Barash Y, Dehan E, Krupsky M, et al. Comparative analysis of algorithms for signal quantitation from oligonucleotide microarrays. *Bioinformatics* 2004; 20: 839.
11. Irizarry RA, Hobbs B, Collin F, et al. Exploration, normalization, and summaries of high density oligonucleotide array probe level data. *Biostatistics* 2003; 4: 249.
12. R Development Core Team. *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing, ISBN 3-900051-07-0, <http://www.R-project.org>, 2008.
13. Benjamini Y, Hochberg Y. Controlling the false discovery rate: A practical and powerful approach to multiple testing. *J R Stat Soc Series B Stat Methodol* 1995; 57: 289.
14. Efron B, Tibshirani R. Empirical bayes methods and false discovery rates for microarrays. *Genet Epidemiol* 2002; 23: 70.
15. Reiner A, Yekutieli D, Benjamini Y. Identifying differentially expressed genes using false discovery rate controlling procedures. *Bioinformatics* 2003; 19: 368.

SDC, Figure 1



SDC, Figure 1. EVLP-directed delivery of ATL1223 improves function in DCD lungs. Temporal changes in pulmonary compliance (top) and pulmonary artery pressure (bottom) throughout the 1-hour EVLP period. Compared to lungs after cold static preservation (CSP), EVLP significantly increased pulmonary compliance and reduced pulmonary artery pressure. ATL1223 treatment during EVLP provided further, significantly improved lung function. Note that lung function in the CSP group (perfused with Krebs-Henseleit buffer for an extended 1-hour period versus 5 minutes as shown in Figure 2) did not significantly change during perfusion. One-way ANOVA with post-hoc Tukey's multiple comparison test was performed to compare experimental groups. Results are presented as mean \pm SEM. * $p < 0.05$ versus CSP; # $p < 0.05$ versus EVLP; $n = 6-9$ /group.

SDC, TABLE 1. Significantly different canonical pathways identified for EVLP vs. CSP

Canonical Pathway	p-value	Genes
Endothelin-1 Signaling	4.1E-07	PIK3CA, GUCY2C, PIK3R1, PLA2G10, SHC3, MAPK13, PRKCZ, JUN, PLCE1, LCAT, GNA15, ECE2, GPLD1, ECE1, PNPLA3, GNA13, PRKD3, CASP14, PRKCA, ATM, PLA2G12A, GNAS, PIK3C2A, ADCY3, GNAI1, GNAQ, GNAI2, GNAI3, PLA2G6, FOS, GAB1, PIK3CD, OPN1SW
Growth Hormone Signaling	4.2E-07	SOCS3, RPS6KB1, PTPN6, PIK3CA, PIK3C2A, PIK3R1, SOCS6, IGFALS, PRKCZ, ONECUT1, FOS, CSHL1, IGF1R, PIK3CD, STAT5B, SOCS7, PRKD3, ATM, PRKCA
IGF-1 Signaling	7.2E-06	IGFBP4, RPS6KB1, SOCS3, PIK3CA, PIK3C2A, YWHAE, PIK3R1, SOCS6, YWHAZ, IGFBP5, IGFBP7, PRKCZ, PRKAG1, FOS, JUN, IGF1R, PIK3CD, SOCS7, SFN, RASA1, ATM
UVB-Induced MAPK Signaling	2.3E-05	TP53, RPS6KB1, PIK3CA, PIK3C2A, PIK3R1, MAPK13, PRKCZ, EIF4EBP1, FOS, JUN, PIK3CD, PRKD3, ATM, PRKCA
Breast Cancer Regulation by Stathmin1	3.2E-05	PIK3CA, PPP2R2A, PIK3R1, PPP1CB, LIMK2, PRKAG1, PRKCZ, GNB4, STMN1, CAMK2D, GNB3, TUBA8, RB1CC1, GNA13, PRKD3, ATM, PRKCA, TP53, GNAS, PIK3C2A, ADCY3, GNAQ, GNAI1, TUBA4A, GNAI2, GNAI3, ARHGEF16, PPP2R2B, UHMK1, PIK3CD, OPN1SW
p70S6K Signaling	6.0E-05	RPS6KB1, PIK3CA, IL2RG, PIK3C2A, YWHAE, F2R, PPP2R2A, PIK3R1, GNAQ, YWHAZ, GNAI1, PRKCZ, GNAI2, GNAI3, PLCE1, PPP2R2B, PIK3CD, SFN, PRKD3, OPN1SW, ATM, PRKCA
P2Y Purigenic Receptor Signaling Pathway	6.0E-05	PIK3CA, GNAS, PIK3C2A, PIK3R1, ADCY3, GNAQ, GNAI1, PRKAG1, PRKCZ, GNAI2, GNAI3, GNB4, FOS, GNB3, PLCE1, JUN, ATF4, PIK3CD, PRKD3, OPN1SW, ATM, PRKCA
Prolactin Signaling	7.4E-05	SOCS3, PIK3CA, PIK3C2A, PIK3R1, SOCS6, NR3C1, PRKCZ, FOS, JUN, PIK3CD, PRLR, STAT5B, SOCS7, PRKD3, ATM, PRKCA
Erythropoietin Signaling	9.5E-05	RPS6KB1, SOCS3, PIK3CA, PTPN6, PIK3C2A, PIK3R1, PRKCZ, FOS, JUN, CBL, PIK3CD, STAT5B, PRKD3, ATM, PRKCA
CCR3 Signaling in Eosinophils	0.00014	PIK3CA, GNAS, PIK3C2A, PLA2G10, PIK3R1, GNAI1, PPP1CB, LIMK2, MAPK13, PRKCZ, GNAI2, GNAI3, PLA2G6, GNB4, GNB3, PIK3CD, PRKD3, OPN1SW, ATM, PRKCA, PLA2G12A
Role of NFAT in Cardiac Hypertrophy	0.00014	IL6ST, PIK3CA, PIK3R1, CSNK1A1, MAPK13, PRKAG1, PRKCZ, GNB4, CAMK2D, GNB3, PLCE1, IGF1R, PRKD3, ATM, PRKCA, GNAS, PIK3C2A, HDAC2, ADCY3, GNAQ, SLC8A3, GNAI1, NFATC4, GNAI2, GNAI3, PIK3CD, SLC8A1, OPN1SW
Relaxin Signaling	0.00015	PIK3CA, GNAS, PIK3C2A, GUCY2C, PDE7A, PIK3R1, ADCY3, GNAQ, GNAI1, PRKAG1, PRKCZ, PDE6H, GNAI2, GNAI3, FOS, GNB4, GNB3, JUN, PDE7B, GNA15, PIK3CD, GNA13, ATM
IL-1 Signaling	0.00035	GNAS, ADCY3, GNAQ, GNAI1, MAPK13, PRKAG1, GNAI2, TRAF6, GNB4, GNAI3, FOS, GNB3, JUN, GNA15, GNA13, IL1RAP, IRAK4
14-3-3-mediated Signaling	0.0004	PIK3CA, PIK3C2A, YWHAE, PIK3R1, YWHAZ, TUBA4A, VIM, PRKCZ, FOS, SRPK2, PLCE1, CBL, JUN, TUBA8, PIK3CD, SFN, TNF, PRKD3, ATM, PRKCA
GDNF Family Ligand-Receptor Interactions	0.0004	DOK5, FOS, PIK3CA, NRTN, JUN, PSPN, GAB1, PIK3C2A, GFRA1, PIK3R1, PIK3CD, GFRA2, RASA1, ATM
Macropinocytosis Signaling	0.0004	ITGB1, PIK3CA, PIK3C2A, PIK3R1, PRKCZ, ABI1, HGF, INS, PIK3CD, ITGB4, PRKD3, ITGB5, ATM, PRKCA
Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis	0.0004	IL6ST, SOCS3, PIK3CA, FZD3, PIK3R1, PRSS2, CSNK1A1, IL17RC, WNT16, WNT8B, CEBPG, NFATC1, PRKCZ, CAMK2D, NLK, JUN, PLCE1, DKK3, ATF4, TNFRSF1B, PRKD3, IL1RAP, WNT5B, ATM, PRKCA, PIK3C2A, IL10, GNAQ, NFATC4, TCF3, IL17A, TRAF6, IL16, FOS, APC2, PIK3CD, SOST, TNF, IRAK4

Role of Oct4 in Mammalian Embryonic Stem Cell Pluripotency	0.0004	TP53,KDM5B,NR6A1,Tdh,PCGF6,NR2F2,FBXO15,NR2F6,BRCA1,SALL4,WWP2
Huntington's Disease Signaling	0.0005	PIK3CA,SGK1,PIK3R1,CLTB,RCOR2,HSPA5,PRKCZ,GNB4,POLR2A,JUN,GNB3,GNA15,CDK5,IGF1R,ATF4,RASA1,PRKD3,NAPA,NAPB,CASP14,ATM,PRKCA,TP53,HDAC2,PIK3C2A,GRM1,HSPA9,GNAQ,GPAA1,CAPN8,CAPN1,PIK3CD
Role of Tissue Factor in Cancer	0.0005	TP53,ITGB1,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,GNAQ,LIMK2,MAPK13,FGG,F10,GNA15,FGB,PIK3CD,GNA13,STAT5B,ITGB5,ATM,PRKCA
CCR5 Signaling in Macrophages	0.0005	GNAS,CD4,GNAI1,MAPK13,PRKCZ,GNAI2,GNB4,GNAI3,FOS,JUN,GNB3,PRKD3,OPN1SW,PRKCA
IL-8 Signaling	0.0005	PIK3CA,PIK3R1,LIMK2,PRKCZ,EIF4EBP1,GNB4,JUN,GNB3,GPLD1,GNA13,PRKD3,ITGB5,LASP1,MYL12B,ATM,PRKCA,RPS6KB1,GNAS,PIK3C2A,GNAI1,GNAI2,TRAF6,GNAI3,FOS,PIK3CD,OPN1SW,IRAK4
α -Adrenergic Signaling	0.0006	GNAS,ADCY3,GNAQ,SLC8A3,GNAI1,PRKCZ,PRKAG1,GNAI2,GNB4,GNAI3,GNB3,ADRA2A,SLC8A1,PRKD3,OPN1SW,PRKCA
ERK5 Signaling	0.0006	IL6ST,RPS6KB1,YWHAE,SGK1,YWHAZ,GNAQ,PRKCZ,FOS,GAB1,ATF4,GNA13,SFN,ELK4
IL-9 Signaling	0.0006	SOCS3,PIK3CA,IL2RG,PIK3C2A,PIK3R1,PIK3CD,STAT5B,TNF,ATM
Ceramide Signaling	0.0007	PIK3CA,PIK3C2A,PPP2R2A,PIK3R1,PRKCZ,KSR1,DIABLO,FOS,JUN,SMPD4,PPP2R2B,PIK3CD,TNFRSF1B,TNF,ATM
PPAR α /RXR α Activation	0.0008	PPARA,ABCA1,PRKAG1,HSP90B1,JUN,PLCE1,GNA15,GPD2,INS,STAT5B,IL1RAP,ITGB5,PRKCA,GNAS,ACAA1,MED1,Cyp2c70,ADCY3,ACVR1,GNAQ,NR2C2,Cyp2c54 (includes others),TGS1,TRAF6,CYP2C8,PPARGC1A
Virus Entry via Endocytic Pathways	0.0008	ITGB1,PIK3CA,AP2A1,PIK3C2A,HLA-A,PIK3R1,CLTB,PRKCZ,ZBTB12,PIK3CD,ITGB4,CXADR,PRKD3,ITGB5,ATM,PRKCA
Synaptic Long Term Depression	0.0008	GNAS,GUCY2C,PPP2R2A,GRM1,PLA2G10,GNAQ,GNAI1,PRKG2,PRKCZ,GNAI2,PLA2G6,GNAI3,PLCE1,LCAT,GNA15,PPP2R2B,IGF1R,PNPLA3,GNA13,PRKD3,PRKCA,PLA2G12A
CXCR4 Signaling	0.0009	PIK3CA,GNAS,PIK3C2A,CD4,PIK3R1,ADCY3,GNAQ,GNAI1,PRKCZ,GNAI2,GNAI3,GNB4,FOS,GNB3,JUN,GNA15,PIK3CD,GNA13,PRKD3,OPN1SW,MYL12B,ATM,PRKCA
CREB Signaling in Neurons	0.0009	PIK3CA,GNAS,PIK3C2A,GRM1,PIK3R1,ADCY3,GNAQ,GNAI1,PRKCZ,PRKAG1,GNAI2,GNAI3,GNB4,GNB3,PLCE1,POLR2A,CAMK2D,GNA15,ATF4,PIK3CD,GNA13,PRKD3,OPN1SW,PRKCA,ATM
Thrombin Signaling	0.001	PIK3CA,F2R,PIK3R1,PPP1CB,MAPK13,PRKCZ,GNB4,CAMK2D,PLCE1,GNB3,GNA15,GNA13,PRKD3,MYL12B,ATM,PRKCA,RPS6KB1,GNAS,PIK3C2A,ADCY3,GNAI1,GNAQ,GNAI2,GNAI3,ARHGEF16,PIK3CD,OPN1SW
AMPK Signaling	0.001	RPS6KB1,PIK3CA,CPT1A,GNAS,CHRNA4,PIK3C2A,PPP2R2A,PIK3R1,CHRN4,MAPK13,PFKFB2,PRKAG1,ADRB3,EIF4EBP1,ADRA2A,INS,PPP2R2B,PIK3CD,AK2,PPAT,ATM

Type II Diabetes Mellitus Signaling	0.001	SOCS3,PIK3CA,PIK3C2A,SLC27A2,PIK3R1,SOCS6,PRKAG1,PRKCZ,SMPD4,INS,ACSL4,PIK3CD,TNFRSF1B,SOCS7,TNF,PRKD3,ACSL1,ATM,PRKCA
Renin-Angiotensin Signaling	0.001	PIK3CA,PTPN6,GNAS,PIK3C2A,PIK3R1,ADCY3,GNAQ,SHC3,MAPK13,PRKCZ,PRKAG1,FOS,JUN,PIK3CD,TNF,PRKD3,ATM,PRKCA
Signaling by Rho Family GTPases	0.001	PIK3CA,PIK3R1,LIMK2,PRKCZ,GNB4,STMN1,JUN,GNB3,GNA15,CIT,GNA13,MYL12B,ATM,ITGB1,GNAS,CDH4,PIK3C2A,SEPT4,SEPT7,GNAI1,RDX,GNAQ,VIM,GNAI2,FOS,MAP3K12,GNAI3,ARHGEF16,CDH17,PIK3CD,SEPT2
Androgen Signaling	0.001	GNAI2,GNAI3,GNB4,GNB3,JUN,POLR2A,GNAS,GNA15,GTF2H4,GNAI1,GNAQ,GTF2H1,GNA13,GTF2A1,PRKD3,PRKAG1,PRKCZ,PRKCA
Myo-inositol Biosynthesis	0.002	IMPA1,IMPAD1,IMPA2
UVA-Induced MAPK Signaling	0.002	TP53,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,ART1,PARP3,MAPK13,FOS,JUN,PLCE1,SMPD4,PIK3CD,ATM,PRKCA
Thrombopoietin Signaling	0.002	FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,PIK3CD,STAT5B,PRKD3,PRKCZ,PRKCA,ATM
JAK/Stat Signaling	0.002	FOS,SOCS3,PTPN6,PIK3CA,JUN,PIK3C2A,PIK3R1,SOCS6,GNAQ,PIK3CD,STAT5B,SOCS7,ATM
Cardiac Hypertrophy Signaling	0.002	PIK3CA,PIK3R1,MAPK13,PRKAG1,ADRB3,GNB4,CACNA1E,JUN,PLCE1,GNB3,GNA15,IGF1R,GNA13,MYL12B,ATM,RPS6KB1,GNAS,PIK3C2A,ADCY3,GNAI1,GNAQ,NFATC4,CACNA1A,GNAI2,MAP3K12,GNAI3,ADRA2A,PIK3CD,OPN1SW
IL-12 Signaling and Production in Macrophages	0.002	PIK3CA,CD40LG,APOA4,PIK3C2A,IL10,PIK3R1,IFNGR1,IFNA4,MAPK13,PRKCZ,TRAF6,FOS,JUN,SERPINA1,PIK3CD,MST1R,TNF,PRKD3,ATM,PRKCA
EGF Signaling	0.002	RPS6KB1,FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,PIK3CD,MAPK13,RASA1,PRKCA,ATM
fMLP Signaling in Neutrophils	0.003	PIK3CA,GNAS,PIK3C2A,PIK3R1,GNAI1,NFATC4,NFATC1,PRKCZ,GNAI2,GNB4,GNAI3,GNB3,PIK3CD,PRKD3,OPN1SW,ATM,PRKCA
Nitric Oxide Signaling in the Cardiovascular System	0.003	PIK3CA,PIK3C2A,GUCY2C,PIK3R1,PRKG2,CACNA1A,PRKCZ,ADRB3,PRKAG1,ATP2A1,HSP90B1,CACNA1E,PIK3CD,PRKD3,ATM,PRKCA
Gap Junction Signaling	0.003	PIK3CA,GNAS,PIK3C2A,GUCY2C,PIK3R1,ADCY3,GNAQ,CSNK1A1,GNAI1,TUBA4A,PRKG2,PRKCZ,PRKAG1,GNAI2,GNAI3,PLCE1,TUBA8,PIK3CD,PRKD3,OPN1SW,ATM,PRKCA
Sphingosine-1-phosphate Signaling	0.003	PIK3CA,GNAS,PIK3C2A,PIK3R1,ADCY3,GNAQ,GNAI1,ASAH2,GNAI2,GNAI3,PLCE1,SMPD4,PIK3CD,GNA13,OPN1SW,CASP14,ATM
Molecular Mechanisms of Cancer	0.003	PIK3CA,FZD3,PIK3R1,WNT16,BMP1B,MAPK13,HIF1A,SMAD5,WNT8B,PRKAG1,PRKCZ,DIABLO,CAMK2D,NLK,JUN,GNA15,CDK5,GNA13,BRCA1,RASA1,PRKD3,WNT5B,PRKCA,ATM,ITGB1,TP53,GNAS,PIK3C2A,ADCY3,GNAI1,GNAQ,TCF3,GNAI2,GNAI3,FOS,CDKN2D,CBL,GAB1,ARHGEF16,PIK3CD,BCL2L11,CTNND1

Tec Kinase Signaling	0.003	ITGB1,PIK3CA,GNAS,PIK3C2A,PIK3R1,GNAQ,GNAI1,PRKCZ,GNAI2,GNB4,FOS,GNAI3,GNB3,GNA15,PIK3CD,GNA13,STAT5B,TNF,TNFRSF10A,PRKD3,ATM,PRKCA
Myc Mediated Apoptosis Signaling	0.003	TP53,PIK3CA,YWHAE,PIK3C2A,PIK3R1,IGF1R,YWHAZ,PIK3CD,SFN,PRKCZ,ATM
Role of Osteoblasts, Osteoclasts and Chondrocytes in Rheumatoid Arthritis	0.004	ADAM17,PIK3CA,FZD3,PIK3R1,CSNK1A1,WNT16,SMAD5,WNT8B,NFATC1,JUN,DKK3,TNFRSF1B,IL1RAP,WNT5B,ATM,ITGB1,PIK3C2A,IL10,NFATC4,TCF3,IL17A,TRAF6,FOS,CBL,APC2,PIK3CD,SOST,TNF
Corticotropin Releasing Hormone Signaling	0.004	GNAS,GUCY2C,CNR1,ADCY3,GNAQ,GNAI1,MAPK13,PRKCZ,PRKAG1,GNAI2,FOS,GNAI3,JUN,ATF4,PRKD3,OPN1SW,PRKCA
IL-4 Signaling	0.004	SYNJ2,RPS6KB1,PTPN6,IL2RG,PIK3CA,PIK3C2A,IL13RA1,PIK3R1,PIK3CD,NFATC4,NR3C1,NFATC1,ATM
eNOS Signaling	0.004	PIK3CA,GNAS,CHRNA4,PIK3C2A,PIK3R1,ADCY3,HSPA9,GNAQ,CHRNA4,AQP4,HSPA5,CNGA1,PRKCZ,PRKAG1,HSP90B1,AQP9,PIK3CD,PRKD3,ATM,PRKCA
Dopamine-DARPP32 Feedback in cAMP Signaling	0.004	GNAS,PPP2R2A,ADCY3,GNAQ,CSNK1A1,GNAI1,PPP1CB,PRKG2,CACNA1A,PRKCZ,PRKAG1,ATP2A1,GNAI2,GNAI3,PLCE1,CACNA1E,CDK5,PPP2R2B,ATF4,PRKD3,OPN1SW,PRKCA
Melatonin Signaling	0.005	GNAI2,GNAI3,PLCE1,CAMK2D,GNAI1,GNAQ,RORC,PRKD3,PRKCZ,PRKAG1,OPN1SW,PRKCA
CTLA4 Signaling in Cytotoxic T Lymphocytes	0.005	PTPN6,AP2A1,PIK3CA,CD80,PIK3C2A,AP1M2,ZBTB12,PPP2R2A,HLA-A,PIK3R1,PPP2R2B,CLTB,PIK3CD,ATM
IL-3 Signaling	0.006	FOS,PIK3CA,PTPN6,JUN,PIK3C2A,PIK3R1,PIK3CD,STAT5B,PRKD3,PRKCZ,PRKCA,ATM
Chemokine Signaling	0.006	GNAI2,GNAI3,FOS,JUN,CAMK2D,GNAI1,GNAQ,PPP1CB,LIMK2,MAPK13,OPN1SW,PRKCA
RAR Activation	0.006	PIK3CA,GNAS,MED1,PIK3R1,ADCY3,NR2F2,SNW1,SMAD5,MAPK13,PRKAG1,PRKCZ,FOS,TRIM24,JUN,GTF2H4,GTF2H1,PIK3CD,NRIP1,NR2F6,STAT5B,PRKD3,PPARGC1A,PRKCA
MSP-RON Signaling Pathway	0.006	KLKB1,PIK3CA,PIK3C2A,PIK3R1,PIK3CD,MST1R,TNF,PRKCZ,ATM
Xenobiotic Metabolism Signaling	0.006	NDST3,PIK3CA,GSTM5,PPP2R2A,PIK3R1,GCLC,MAPK13,PRKCZ,HSP90B1,CAMK2D,CES1,Gstm3,HS6ST2,PRKD3,PRKCA,ATM,PIK3C2A,MED1,GRIP1,UGT8,MAP3K12,HS3ST3B1,Ces1e,SMOX,PPP2R2B,CAT,PIK3CD,NRIP1,TNF,EIF2AK3,PPARGC1A,CYP2C8
IL-17A Signaling in Airway Cells	0.007	TRAF6,CXCL3,PIK3CA,PIK3C2A,PIK3R1,IL17RC,MUC5AC,PIK3CD,MAPK13,ATM,IL17A
GNRH Signaling	0.007	GNAS,ADCY3,GNAQ,GNAI1,MAPK13,PRKCZ,PRKAG1,GNAI2,FOS,MAP3K12,GNAI3,JUN,CAMK2D,GNA15,ATF4,PRKD3,OPN1SW,PRKCA
Acute Phase Response Signaling	0.007	IL6ST,SOCS3,PIK3CA,PIK3R1,SOCS6,MAPK13,TCF3,NR3C1,FGG,TRAF6,KLKB1,FOS,JUN,SAA1,CRP,SERPINA1,FGB,PIK3CD,TNFRSF1B,SOCS7,TNF,IL1RAP
NF-κB Activation by Viruses	0.007	ITGB1,PIK3CA,PIK3C2A,CD4,PIK3R1,PIK3CD,EIF2AK2,PRKD3,ITGB5,PRKCZ,PRKCA,ATM

Ephrin B Signaling	0.007	GNAI2,GNAI3,GNB4,GNAS,GNB3,CBL,ABI1,GNA15,EFNB1,GNAI1,GNAQ,GNA13
Production of Nitric Oxide and Reactive Oxygen Species in Macrophages	0.008	PPARA,PTPN6,PIK3CA,APOA4,PIK3C2A,PPP2R2A,PIK3R1,PPP1CB,IFNGR1,MAPK13,PRKCZ,MAP3K12,FOS,JUN,CAT,PPP2R2B,SERPINA1,PIK3CD,TNFRSF1B,PRKD3,TNF,PRKCA,ATM
Hypoxia Signaling in the Cardiovascular System	0.008	UBE2D4,TP53,HSP90B1,JUN,UBE2M,COPS5,UBE2D2,ATF4,HIF1A,UBE2L6,ATM
Leptin Signaling in Obesity	0.008	SOCS3,PIK3CA,GNAS,PLCE1,PIK3C2A,PIK3R1,INS,ADCY3,AGRP,PIK3CD,PRKAG1,ATM
Neuroprotective Role of THOP1 in Alzheimer's Disease	0.008	NFYA,YWHAE,ECE2,HLA-A,ECE1,THOP1,PRKAG1,APP
IL-17A Signaling in Gastric Cells	0.009	FOS,JUN,IL17RC,MAPK13,TNF,IL17A
Role of PI3K/AKT Signaling in the Pathogenesis of Influenza	0.009	GNAI2,GNAI3,PIK3CA,PIK3C2A,PIK3R1,GNAI1,PIK3CD,IFNA4,IRF3,OPN1SW,ATM
Hepatic Cholestasis	0.009	ABCG8,PPARA,GNAS,GCGR,ADCY3,PRKAG1,PRKCZ,IL17A,TRAF6,JUN,ABCB4,ABCC1,INS,ABCB11,TNFRSF1B,TIRAP,PRKD3,TNF,IL1RAP,IRAK4,PRKCA
PI3K/AKT Signaling	0.010	TP53,ITGB1,RPS6KB1,PIK3CA,CDC37,YWHAE,PPP2R2A,PIK3R1,YWHAZ,PRKCZ,EIF4EBP1,SYNJ2,HSP90B1,GAB1,PPP2R2B,PIK3CD,SFN
Cardiac β -adrenergic Signaling	0.010	GNAS,PDE7A,PPP2R2A,ADCY3,SLC8A3,PPP1CB,AKAP7,CACNA1A,PRKAG1,ATP2A1,PDE6H,GNB4,GNB3,CACNA1E,PDE7B,PKIB,PPP2R2B,SLC8A1
FGF Signaling	0.010	PIK3CA,PTPN6,PIK3C2A,PIK3R1,FGFR1,MAPK13,FGF10,GAB1,HGF,ATF4,PIK3CD,ATM,PRKCA
HER-2 Signaling in Breast Cancer	0.010	ITGB1,TP53,PIK3CA,PIK3C2A,PIK3R1,PIK3CD,ITGB4,PRKD3,ITGB5,PRKCZ,PRKCA,ATM
VEGF Family Ligand-Receptor Interactions	0.010	PLA2G6,FOS,PIK3CA,PIK3C2A,PLA2G10,PIK3R1,PIK3CD,PRKD3,PRKCZ,PRKCA,ATM,PLA2G12A
Insulin Receptor Signaling	0.010	RPS6KB1,SOCS3,PIK3CA,PIK3C2A,SGK1,PIK3R1,PPP1CB,STXBP4,ACLY,PRKCZ,PRKAG1,EIF4EBP1,SYNJ2,CBL,GAB1,INS,PIK3CD,ATM
HGF Signaling	0.011	ITGB1,PIK3CA,PIK3C2A,PIK3R1,PRKCZ,MAP3K12,ELF4,FOS,JUN,GAB1,HGF,PIK3CD,PRKD3,ATM,PRKCA
ATM Signaling	0.011	TP53,SMC3,JUN,GADD45B,SMC1B,ATF4,MAPK13,CBX5,BRCA1,ATM
UVC-Induced MAPK Signaling	0.011	TP53,FOS,JUN,SMPD4,MAPK13,PRKD3,PRKCZ,PRKCA
Glucocorticoid Receptor Signaling	0.012	PIK3CA,SGK1,PIK3R1,MAPK13,HSPA5,GTF2A1,NR3C1,NFATC1,PRKAG1,FGG,CXCL3,HSP90B1,JUN,POLR2A,STAT5B,ATM,PIK3C2A,MED1,IL10,HSPA9,TAT,NFATC4,TRAF6,FOS,TAF6L,GTF2H4,GTF2H1,PIK3CD,NRIP1,TNF
ERK/MAPK Signaling	0.012	ITGB1,PIK3CA,PIK3C2A,PPP2R2A,PLA2G10,PIK3R1,YWHAZ,PPP1CB,DUSP2,NFATC1,PRKAG1,KSR1,EIF4EBP1,PLA2G6,ELF4,FOS,PPP2R2B,MKNK1,ATF4,PIK3CD,ATM,PRKCA,PLA2G12A

Antioxidant Action of Vitamin C	0.013	PLA2G10,MAPK13,SLC2A3,TXNRD3,PLA2G6,SLC23A1,PLCE1,LCAT,GPLD1,PNPLA3,STAT5B,TXNRD2,TNF,PLA2G12A
G Beta Gamma Signaling	0.013	GNAI2,GNB4,GNAI3,GNB3,GNAS,GNA15,GNAQ,GNAI1,GNA13,PRKD3,PRKAG1,PRKCZ,PRKCA
RANK Signaling in Osteoclasts	0.013	TRAF6,FOS,MAP3K12,PIK3CA,CBL,JUN,PIK3C2A,MITF,PIK3R1,PIK3CD,MAPK13,NFATC1,ATM
Role of Pattern Recognition Receptors in Recognition of Bacteria and Viruses	0.013	PIK3CA,Oas1h,PIK3C2A,IL10,PIK3R1,IRF3,C1QB,IFNA4,PRKCZ,IL17A,TRAF6,PIK3CD,EIF2AK2,TNF,PRKD3,ATM,PRKCA
IL-17A Signaling in Fibroblasts	0.013	TRAF6,FOS,JUN,IL17RC,MAPK13,NFKBIZ,IL17A
Stearate Biosynthesis I (Animals)	0.013	Ces1e,SLC27A2,ACOT1,ACSL4,ACSL1,ACOT8,ELOVL6
Reelin Signaling in Neurons	0.013	ITGB1,PIK3CA,CDK5,PIK3C2A,PIK3R1,CNR1,ARHGEF16,PIK3CD,PAFAH1B1,VLDLR,ATM,APP
p53 Signaling	0.013	TP53,PIK3CA,JUN,GADD45B,PIK3C2A,MED1,PIK3R1,CCNK,PIK3CD,HIF1A,BRCA1,SFN,TNFRSF10A,ATM
NRF2-mediated Oxidative Stress Response	0.015	USP14,PIK3CA,PIK3C2A,GSTM5,PIK3R1,GCLC,JUNB,PRKCZ,FOS,JUN,Gstm3,ABCC1,DNAJC8,CAT,DNAJC18,ATF4,IK3CD,PTPLAD1,EIF2AK3,PRKD3,PRKCA,ATM
Fc Epsilon RI Signaling	0.015	PIK3CA,PIK3C2A,PLA2G10,PIK3R1,MAPK13,PRKCZ,SYNJ2,PLA2G6,GAB1,PIK3CD,PRKD3,TNF,PLA2G12A,ATM,PRKCA
T Helper Cell Differentiation	0.015	IL6ST,CD40LG,IL2RG,CD80,IL10,IFNGR1,TNFRSF1B,RORC,TNF,ICOSLG/LOC102723996,IL17A
Renal Cell Carcinoma Signaling	0.015	FOS,PIK3CA,JUN,GAB1,PIK3C2A,PIK3R1,HGF,PIK3CD,HIF1A,TCEB1,ATM
IL-2 Signaling	0.015	FOS,PIK3CA,IL2RG,JUN,PIK3C2A,PIK3R1,PIK3CD,STAT5B,ATM
Phototransduction Pathway	0.015	RGS9,GNB3,GUCY2C,GNGT1,GRK1,CNGA1,PRKAG1,OPN1SW,PDE6H
Estrogen-Dependent Breast Cancer Signaling	0.015	FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,IGF1R,ATF4,PIK3CD,STAT5B,ATM
Methylglyoxal Degradation I	0.016	HAGH,GLO1
5-aminoimidazole Ribonucleotide Biosynthesis I	0.016	PPAT,GART
Role of NFAT in Regulation of the Immune Response	0.016	PIK3CA,GNAS,PIK3C2A,CD4,PIK3R1,GNAQ,CSNK1A1,GNAI1,NFATC4,NFATC1,GNAI2,GNAI3,FOS,GNB4,GNB3,JUN,CD80,GNA15,PIK3CD,GNA13,ATM
Vitamin-C Transport	0.017	SLC23A1,TXNRD2,SLC2A3,TXNRD3
Endoplasmic Reticulum Stress Pathway	0.017	HSP90B1,ERN1,ATF4,HSPA5,EIF2AK3
IL-17 Signaling	0.017	TRAF6,PIK3CA,JUN,PIK3C2A,PIK3R1,CRP,IL17RC,PIK3CD,MAPK13,ATM,IL17A
Role of IL-17A in Arthritis	0.017	CXCL3,PIK3CA,PIK3C2A,PIK3R1,IL17RC,PIK3CD,MAPK13,ATM,IL17A
Role of NANOG in Mammalian Embryonic Stem Cell Pluripotency	0.017	TP53,IL6ST,PIK3CA,PIK3C2A,FZD3,PIK3R1,WNT16,BMPR1B,SMAD5,WNT8B,GAB1,PIK3CD,WNT5B,ATM,SALL4

NF- κ B Signaling	0.018	PIK3CA,CD40LG,PIK3C2A,HDAC2,PIK3R1,FGFR1,TBK1,BMPR1B,PRKCZ,TRAF6,NTRK3,BCL10,INS,IGF1R,PIK3CD,EIF2AK2,TNFRSF1B,TIRAP,TNF,IRAK4,ATM
LPS-stimulated MAPK Signaling	0.019	FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,PIK3CD,MAPK13,PRKD3,PRKCZ,PRKCA,ATM
Protein Kinase A Signaling	0.019	HIST1H1C,PDE7A,PTPN13,PPP1CB,GRK1,PTPN5,AKAP7,PRKAG1,PRKCZ,NFATC1,DUSP2,GNB4,CAMK2D,PLCE1,GNB3,PDE7B,ATF4,GNA13,PRKD3,MYL12B,PRKCA,PTPN6,GNAS,PTPRK,YWHAE,ADCY3,GNAI1,YWHAZ,GNAQ,NFATC4,TCF3,CNGA1,PDE6H,GNAI2,ANAPC4,GNAI3,PTPRS,TNNI1,SFN,OPN1SW
FLT3 Signaling in Hematopoietic Progenitor Cells	0.020	RPS6KB1,PIK3CA,CBL,PIK3C2A,PIK3R1,ATF4,PIK3CD,MAPK13,STAT5B,EIF4EBP1,ATM
CD40 Signaling	0.021	TRAF6,FOS,PIK3CA,CD40LG,JUN,PIK3C2A,PIK3R1,PIK3CD,MAPK13,ATM
Fatty Acid β -oxidation I	0.021	HADHB,SLC27A2,ACAA1,ACSL4,ACSL1,HADH
Role of p14/p19ARF in Tumor Suppression	0.021	TP53,PIK3CA,PIK3C2A,PIK3R1,PIK3CD,ATM
Melanocyte Development and Pigmentation Signaling	0.021	RPS6KB1,PIK3CA,PTPN6,GNAS,PIK3C2A,MITF,PIK3R1,ADCY3,ATF4,PIK3CD,PRKAG1,ATM
PPAR Signaling	0.022	TRAF6,PPARA,FOS,HSP90B1,JUN,MED1,INS,NRIP1,STAT5B,TNFRSF1B,IL1RAP,TNF,PPARGC1A
Rac Signaling	0.022	ITGB1,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,LIMK2,PRKCZ,IQGAP2,JUN,CYFIP2,PIK3CD,ELK4,ATM,IQGAP3
TR/RXR Activation	0.023	F10,PIK3CA,UCP3,PIK3C2A,MED1,PIK3R1,SYT2,PIK3CD,HIF1A,ATM,PPARGC1A,ATP2A1
mTOR Signaling	0.023	RPS6KB1,PIK3CA,PIK3C2A,PPP2R2A,PIK3R1,HIF1A,RICTOR,PRKAG1,PRKCZ,EIF4EBP1,ATG13,RPS4Y1,INS,GPLD1,PPP2R2B,RPS9,PRR5,PIK3CD,PRKD3,ATM,PRKCA,RPS24
IL-15 Signaling	0.023	PIK3CA,IL2RG,PIK3C2A,PIK3R1,PIK3CD,MAPK13,STAT5B,TNF,ATM,IL17A
Hereditary Breast Cancer Signaling	0.023	TP53,PIK3CA,PMS2,GADD45B,HDAC2,PIK3C2A,PIK3R1,POLR2A,MSH2,RFC2,PIK3CD,BRCA1,SFN,FANCA,ATM
Mouse Embryonic Stem Cell Pluripotency	0.023	TP53,IL6ST,ID2,PIK3CA,PIK3C2A,FZD3,PIK3R1,PIK3CD,SMAD5,MAPK13,TCF3,ID3,ATM
Regulation of eIF4 and p70S6K Signaling	0.024	ITGB1,RPS6KB1,PIK3CA,PIK3C2A,EIF4EBP2,PPP2R2A,PIK3R1,MAPK13,PRKCZ,EIF4EBP1,EIF2S2,RPS4Y1,PPP2R2B,MKNK1,RPS9,PIK3CD,RPS24,ATM
Ketolysis	0.025	HADHB,BDH1,OXCT1
ErbB Signaling	0.025	RPS6KB1,FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,PIK3CD,MAPK13,PRKD3,PRKCZ,PRKCA,ATM
IL-6 Signaling	0.025	IL6ST,SOCS3,PIK3CA,PIK3C2A,PIK3R1,MAPK13,TRAF6,FOS,JUN,CRP,PIK3CD,TNFRSF1B,IL1RAP,TNF,ATM
Neurotrophin/TRK Signaling	0.026	FOS,PIK3CA,JUN,GAB1,PIK3C2A,NTRK3,PIK3R1,ATF4,PIK3CD,ATM
PDGF Signaling	0.027	SYNJ2,FOS,PIK3CA,JUN,PIK3C2A,PIK3R1,PIK3CD,EIF2AK2,RASA1,PRKCA,ATM
Cell Cycle: G2/M DNA	0.027	TP53,YWHAE,YWHAZ,SFN,BRCA1,PRKCZ,SKP2,ATM

Damage Checkpoint Regulation		
T Cell Receptor Signaling	0.028	FOS,PIK3CA,CBL,JUN,PIK3C2A,BCL10,PIK3R1,CD4,PIK3CD,NFATC4,RASA1,NFATC1,ATM
PI3K Signaling in B Lymphocytes	0.028	PIK3CA,ATF3,PIK3R1,NFATC4,PLEKHA4,PRKCZ,NFATC1,FOS,CAMK2D,CBL,JUN,PLCE1,BCL10,ATF4,PIK3AP1,PIK3CD
iCOS-iCOSL Signaling in T Helper Cells	0.030	PIK3CA,CD40LG,IL2RG,PIK3C2A,CD4,PIK3R1,NFATC4,PLEKHA4,NFATC1,CAMK2D,CD80,PIK3CD,ICOSLG/LOC102723996,ATM
Cellular Effects of Sildenafil (Viagra)	0.030	SLC4A5,GNAS,GUCY2C,CACNG4,ADCY3,PPP1CB,PRKG2,MYH11,PRKAG1,CACNA1A,CACNG2,PLCE1,CACNA1E,CACNG7,CACNG8,MYL12B
CDK5 Signaling	0.032	ITGB1,GNAS,PPP2R2A,CABLES1,ADCY3,PPP1CB,MAPK13,PRKAG1,CACNA1A,FOSB,CDK5,CAPN1,PPP2R2B
Telomerase Signaling	0.032	TERF2,TP53,ELF4,HSP90B1,IL2RG,PIK3CA,PIK3C2A,HDAC2,PPP2R2A,PIK3R1,PPP2R2B,PIK3CD,ATM
ErbB4 Signaling	0.032	ADAM17,PIK3CA,PIK3C2A,PIK3R1,PIK3CD,PRKD3,PRKCZ,PRKCA,ATM
RhoGDI Signaling	0.033	ITGB1,GNAS,CDH4,GNAQ,GNAI1,RDX,LIMK2,GRIP1,ARHGAP5,GNAI2,GNB4,GNAI3,GNB3,GNA15,ARHGEF16,CDH17,ARHGAP12,GNA13,MYL12B,PRKCA
Mitochondrial L-carnitine Shuttle Pathway	0.033	CPT1A,SLC27A2,ACSL4,ACSL1
Amyloid Processing	0.034	CAPN8,CDK5,CAPN1,MARK1,CSNK1A1,MAPK13,PRKAG1,APP
Melanoma Signaling	0.034	TP53,PIK3CA,PIK3C2A,MITF,PIK3R1,PIK3CD,ATM
Ovarian Cancer Signaling	0.034	TP53,RPS6KB1,PIK3CA,PMS2,PIK3C2A,FZD3,PIK3R1,WNT16,TCF3,WNT8B,PRKAG1,MSH2,PIK3CD,BRCA1,WNT5B,ATM
Neuropathic Pain Signaling In Dorsal Horn Neurons	0.034	PIK3CA,PIK3C2A,GRM1,PIK3R1,PRKCZ,PRKAG1,FOS,PLCE1,CAMK2D,PIK3CD,PRKD3,ATM,PRKCA
Gluconeogenesis I	0.035	PGK1,PGAM1,ME2,MDH1,ALDOC
B Cell Receptor Signaling	0.039	RPS6KB1,PTPN6,PIK3CA,PIK3C2A,APBB1IP,PIK3R1,MAPK13,NFATC4,TCF3,NFATC1,SYNJ2,MAP3K12,JUN,CAMK2D,GAB1,BCL10,ATF4,PIK3AP1,PIK3CD,ATM
Leukocyte Extravasation Signaling	0.039	ITGB1,PIK3CA,PIK3C2A,PIK3R1,CLDN19,RDX,GNAI1,MAPK13,PRKCZ,GNAI2,ARHGAP5,F11R,GNAI3,ARHGAP12,PIK3CD,PRKD3,CTTN,OPN1SW,ATM,PRKCA,CTNND1,TIMP2
Valine Degradation I	0.041	HIBCH,HADHB,BCKDHA,ACADSB
D-myo-inositol (1,4,5)-trisphosphate Degradation	0.041	SYNJ2,IMPA1,IMPAD1,IMPA2
Protein Ubiquitination Pathway	0.041	PSMB4,USP14,UBE2M,HLA-A,DNAJC27,HSPA9,UBE2D2,PSMC4,THOP1,HSPA5,UBE2L6,TCEB1,TAP1,SKP2,TRAF6,UBE2D4,UCHL1,PSMD11,ANAPC4,USP7,HSP90B1,CBL,ZBTB12,DNAJC8,USP47,DNAJC18,BRCA1

Human Embryonic Stem Cell Pluripotency	0.041	PIK3CA,GNAS,PIK3C2A,FZD3,PIK3R1,FGFR1,ACVR1,WNT16,SMAD5,TCF3,WNT8B,NTRK3,PIK3CD,WNT5B,ATM,SALL4
HIF1 α Signaling	0.042	TP53,PIK3CA,JUN,PIK3C2A,PIK3R1,COPS5,PIK3CD,HIF1A,MAPK13,LDHC,TCEB1,SLC2A3,ATM
G-Protein Coupled Receptor Signaling	0.043	PIK3CA,PDE7A,PIK3R1,TAAR1,PRKAG1,ADRB3,OPRL1,CAMK2D,PDE7B,GNA15,ATF4,RASA1,ATM,PRKCA,GNAS,PIK3C2A,GRM1,NPY1R,CNR1,ADCY3,GNAI1,GNAQ,PDE6H,GNAI2,GNAI3,ADRA2A,PIK3CD
Tight Junction Signaling	0.043	CPSF2,CSTF1,PPP2R2A,CLDN19,YBX3,CASK,MYH11,GPA1,PRKAG1,PRKCZ,FOS,F11R,JUN,PPP2R2B,INADL,TNFRSF1B,TNF,NAPA,NAPB
Coagulation System	0.043	F10,KLKB1,F2R,SERPINA1,FGB,FGG
Role of JAK2 in Hormone-like Cytokine Signaling	0.043	SOCS3,PTPN6,SOCS6,PRLR,SOCS7,STAT5B
Antiproliferative Role of Somatostatin Receptor 2	0.043	GNB4,PIK3CA,PTPN6,GNB3,GUCY2C,PIK3C2A,PIK3R1,PIK3CD,ATM
Purine Nucleotides De Novo Biosynthesis II	0.044	PAICS,PPAT,GART
STAT3 Pathway	0.044	MAP3K12,SOCS3,PTPN6,NTRK3,FGFR1,SOCS6,IGF1R,MAPK13,BMP1B,SOCS7
Axonal Guidance Signaling	0.046	PIK3CA,ADAM17,FZD3,PIK3R1,WNT16,LIMK2,WNT8B,PRKCZ,PRKAG1,NFATC1,GNB4,PLCE1,GNB3,GNA15,CDK5,TUBA8,ECE2,EFNB1,MKNK1,GNA13,RASA1,PRKD3,MYL12B,WNT5B,ATM,PRKCA,ITGB1,GNAS,PIK3C2A,COPS5,TUBA4A,GNAI1,GNAQ,NFATC4,EPHA3,GNAI2,GNAI3,SRGAP3,NTRK3,EPHA5,PIK3CD,OPN1SW
SAPK/JNK Signaling	0.046	TP53,MAP3K12,PIK3CA,JUN,GNB3,GAB1,PIK3C2A,PIK3R1,PIK3CD,GNA13,NFATC1,ATM
Gaq Signaling	0.047	PIK3CA,GNAS,PIK3C2A,GRM1,PIK3R1,GNAQ,NFATC4,PRKCZ,NFATC1,GNB4,GNB3,GNA15,GPLD1,PIK3CD,PRKD3,ATM,PRKCA
Wnt/ β -catenin Signaling	0.047	TP53,FRAT1,PPP2R2A,FZD3,GNAQ,CSNK1A1,ACVR1,WNT16,TCF3,WNT8B,NLK,JUN,SOX6,APC2,DKK3,PPP2R2B,WNT5B,SOX5,SOX3
Tetrahydrofolate Salvage from 5,10-methenyltetrahydrofolate	0.048	MTHFD1,GART
Folate Polyglutamylation	0.048	SHMT1,MTHFD1
Acetate Conversion to Acetyl-CoA	0.048	ACSS2,ACSL1
GADD45 Signaling	0.048	TP53,GADD45B,BRCA1,ATM
DNA damage-induced 14-3-3 σ Signaling	0.048	TP53,SFN,BRCA1,ATM
Glioma Signaling	0.049	TP53,PIK3CA,CDKN2D,CAMK2D,PIK3C2A,PIK3R1,IGF1R,PIK3CD,PRKD3,PRKCZ,PRKCA,ATM

SDC, TABLE 2. Significantly different canonical pathways identified for EVLP+ATL-1223 vs. CSP.

Canonical Pathway	p-value	Genes
IGF-1 Signaling	3.5E-07	IGFBP4,SOCS3,PIK3CA,PIK3R1,SOCS6,PDPK1,IGFBP7,PRKAG1,PRKCZ,AKT1,JUN,IGF1R,CSNK2A1,RASA1,ATM,RPS6KB1,PIK3C2A,YWHAE,YWHAZ,IGFBP5,CSNK2A2,FOS,PTPN11,IRS1,SFN,SOCS5
Type II Diabetes Mellitus Signaling	1.5E-05	SOCS3,PIK3CA,SLC27A2,PIK3R1,SOCS6,ADIPOQ,PDPK1,MAP3K5,PRKAG1,PRKCZ,TRADD,AKT1,SMPD4,NGFR,INS,ACSL4,TNFRSF1B,PRKD3,ATM,PIK3C2A,Irs4,MAPK12,IRS1,SOCS5,TNF,ACSL1
Molecular Mechanisms of Cancer	4.1E-05	GAB2,PIK3R1,WNT16,BMPR1B,CCND1,RASGRF1,PAK1,CAMK2D,RHOB,GNA13,BRCA1,RASA1,PRKD3,ATM,TP53,MAPK12,TCF3,RAC3,ADCY9,RASGRF2,CBL,GAB1,PTPN11,IRS1,ARHGEF16,PIK3CA,RALA,MAP3K5,SMAD5,WNT8B,PRKCZ,PRKAG1,DIABLO,JUN,AKT1,NLK,CDK5,BMPR1A,ARHGEF3,ITGB1,PIK3C2A,GNAQ,GNAI1,XIAP,SIN3A,GNAI2,GNAI3,FOS,CDKN2D,MAPK14,WNT3A,CDKN1A,ATR,CDKN1B,BCL2L11,CTNND1,WNT5A
14-3-3-mediated Signaling	4.5E-05	PIK3CA,PIK3R1,MAP3K5,PRKCZ,TUBB2B,SRPK2,AKT1,JUN,PLCE1,TUBA8,GFAP,PRKD3,ATM,YWHAE,PIK3C2A,YWHAZ,VIM,MAPK12,FOS,TUBA1A,CBL,CDKN1B,SFN,TNF,SNCA
GADD45 Signaling	0.0001	TP53,GADD45B,GADD45G,CDKN1A,ATR,BRCA1,CCND1,ATM
p70S6K Signaling	0.0002	RPS6KB1,F2RL2,IL4R,PIK3CA,IL2RG,PIK3C2A,YWHAE,F2R,PPP2R2A,PIK3R1,GNAQ,YWHAZ,GNAI1,PDPK1,PRKCZ,GNAI2,GNAI3,PLCE1,AKT1,IRS1,PPP2R2B,SFN,PRKD3,ATM
HGF Signaling	0.0002	ITGB1,PIK3CA,PIK3C2A,PIK3R1,MAP3K5,MAPK12,CCND1,PRKCZ,FOS,ELF4,MAP3K12,ELF2,PAK1,JUN,AKT1,PTPN11,GAB1,HGF,CDKN1A,Map3k7,PRKD3,ATM
Huntington's Disease Signaling	0.0002	PIK3CA,VTI1A,BDNF,SGK1,PIK3R1,NAPG,PDPK1,RCOR2,HSPA5,AP2A2,PRKCZ,TGM2,GNB4,JUN,AKT1,POLR2A,GNB3,CDK5,HDAC11,CASQ1,IGF1R,ATF4,RASA1,PRKD3,NAPB,ATM,TP53,PIK3C2A,IFT57,GNAQ,GPAA1,SIN3A,HSPA8,POLR2E,PENK,UBC,DNM1L,SNCA
Acute Phase Response Signaling	0.0003	IL6ST,ECSIT,SOCS3,PIK3CA,PIK3R1,SOCS6,PDPK1,CP,MAP3K5,NR3C1,IRAK1,TRADD,JUN,AKT1,SAA1,NGFR,SERPINA1,FGB,TNFRSF1B,TCF3,MAPK12,TRAF6,KLKB1,FOS,RIPK1,MAPK14,PTPN11,CRP,SOCS5,TNF
PTEN Signaling	0.0004	ITGB1,RPS6KB1,PIK3CA,PIK3R1,PDPK1,BMPR1B,CCND1,RAC3,PRKCZ,DDR1,CSNK2A2,AKT1,CBL,MAGI1,BMPR1A,NTRK3,NGFR,CDKN1A,CSNK2A1,IGF1R,CDKN1B,BCL2L11,MAGI3
Breast Cancer Regulation by Stathmin1	0.0005	PIK3CA,PPP2R2A,PIK3R1,PPP1CB,PPP1R3A,PPP1R14B,PRKAG1,PRKCZ,TUBB2B,GNB4,PAK1,STMN1,CAMK2D,GNB3,TUBA8,RB1CC1,ARHGEF3,GNA13,PRKD3,ATM,TP53,PIK3C2A,GNAQ,GNAI1,GNAI2,ADCY9,GNAI3,TUBA1A,ARHGEF16,PPP2R2B,CDKN1A,CDKN1B
RAR Activation	0.0006	PIK3CA,RDH10,PIK3R1,PDPK1,SMAD5,MAP3K5,PRKAG1,PRKCZ,NR2F1,TRIM24,KAT2B,AKT1,JUN,PNRC1,RDH16,CSNK2A1,PRKD3,DHRS3,MED1,SNW1,MAPK12,FOS,CSNK2A2,ADCY9,ADH7,MAPK14,GTF2H4,GTF2H1,NRIP1,PPARGC1A
Hereditary Breast Cancer Signaling	0.0006	TP53,PMS2,PIK3CA,GADD45B,PIK3C2A,GADD45G,PIK3R1,FANCC,CCND1,POLR2A,AKT1,RFC4,POLR2E,HDAC11,CDKN1A,MSH6,ATR,UBC,SFN,BRCA1,FANCA,ATM
Prolactin Signaling	0.0007	SOCS3,PIK3CA,PIK3C2A,PIK3R1,SOCS6,PDPK1,NR3C1,PRKCZ,FOS,JUN,PTPN11,IRS1,PRLR,SOCS5,PRKD3,ATM
UVB-Induced MAPK Signaling	0.0008	TP53,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,MAPK12,PRKCZ,FOS,AKT1,JUN,MAPK14,PRKD3,ATM

Role of Osteoblasts, Osteoclasts and Chondrocytes in Rheumatoid Arthritis	0.0008	PIK3CA,NFATC3,PIK3R1,CSNK1A1,WNT16,MAP3K5,SMAD5,WNT8B,NFATC1,TRADD,JUN,AKT1,BMP1A,NGFR,TNFRSF1B,PPP3CA,ATM,ITGB1,PIK3C2A,IL10,TCF7L1,MAPK12,TCF3,IL7,CSF1R,XIAP,IL17A,TRAF6,FOS,MAPK14,CBL,WNT3A,SFRP1,TNF,WNT5A
Superpathway of Cholesterol Biosynthesis	0.0008	MVD,HADHB,FDFT1,EBP,IDI1,HSD17B7,LSS,SC5D,GGPS1
Induction of Apoptosis by HIV1	0.0008	TP53,SLC25A13,MAP3K5,MAPK12,SLC25A5,XIAP,DIABLO,TRADD,RIPK1,NGFR,IKBKAP,SLC25A10,TNFRSF1B,TNF
Neurotrophin/TRK Signaling	0.0009	PIK3CA,PIK3C2A,BDNF,PIK3R1,PDPK1,MAP3K5,FOS,AKT1,JUN,PTPN11,GAB1,NTRK3,NGFR,ATF4,ATM
RANK Signaling in Osteoclasts	0.0009	PIK3CA,PIK3C2A,MITF,PIK3R1,MAP3K5,MAPK12,XIAP,NFATC1,TRAF6,FOS,MAPK12,MAPK14,JUN,CBL,AKT1,Map3k7,PPP3CA,ATM
NRF2-mediated Oxidative Stress Response	0.0009	USP14,PIK3CA,GSTM5,PIK3R1,GCLC,DNAJC3,MAP3K5,PRKCZ,GSTT2/GSTT2B,JUN,GSTM2,AKT1,SCARB1,Gstm3,KEAP1,ABCC1,UBE2K,ATF4,PRKD3,ACTA1,ATM,PIK3C2A,JUNB,GSTO1,TXNRD1,DNAJC11,FOS,MAPK14,CAT,PTPLAD1
Macropinocytosis Signaling	0.001	ITGB1,PIK3CA,PIK3C2A,PIK3R1,CSF1R,PRKCZ,PAK1,ABI1,HGF,INS,ITGB4,ITGB6,PRKD3,ITGB5,ATM
AMPK Signaling	0.001	RPS6KB1,PIK3CA,CPT1A,CHRNA4,PIK3C2A,PPP2R2A,PIK3R1,ADIPOQ,PDPK1,MAPK12,PRKAG1,Ins1,AKT1,MAPK14,KAT2B,ADRB1,ADRA2A,IRS1,INS,PPP2R2B,AK4,AK2,PPAT,ATM
Growth Hormone Signaling	0.001	RPS6KB1,SOCS3,PIK3CA,PIK3C2A,PIK3R1,SOCS6,PDPK1,PRKCZ,ONECUT1,FOS,IRS1,IGF1R,SOCS5,PRKD3,ATM
HER-2 Signaling in Breast Cancer	0.001	TP53,ITGB1,PIK3CA,PIK3C2A,PIK3R1,MAP3K5,CCND1,PRKCZ,AKT1,CDKN1A,CDKN1B,ITGB4,ITGB6,PRKD3,ITGB5,ATM
p53 Signaling	0.001	TP53,PIK3CA,GADD45B,PIK3C2A,GADD45G,MED1,PIK3R1,CCND1,SCO2,KAT2B,AKT1,JUN,MAPK14,CDKN1A,CCNK,ATR,SFN,BRCA1,ATM
EGF Signaling	0.001	RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,MAPK12,CSNK2A2,FOS,AKT1,JUN,MAPK14,CSNK2A1,RASA1,ATM
ERK5 Signaling	0.001	IL6ST,RPS6KB1,YWHAE,SGK1,GNAQ,YWHAZ,PRKCZ,FOS,AKT1,PTPN11,GAB1,ATF4,GNA13,SFN
TR/RXR Activation	0.002	PIK3CA,PIK3C2A,MED1,PIK3R1,ATP2A1,F10,UCP3,ADRB1,AKT1,SCARB1,CYP7A1,STRBP,SYT2,TBL1XR1,RCAN2,PPARGC1A,ATM
PI3K/AKT Signaling	0.002	TP53,ITGB1,GAB2,RPS6KB1,CDC37,PIK3CA,YWHAE,PPP2R2A,PIK3R1,GDF15,YWHAZ,PDPK1,MAP3K5,CCND1,PRKCZ,HSP90B1,AKT1,GAB1,PPP2R2B,CDKN1A,CDKN1B,SFN
Gap Junction Signaling	0.002	PIK3CA,GUCY2C,PIK3R1,CSNK1A1,PRKG2,PRKAG1,PRKCZ,TUBB2B,ADRB1,AKT1,PLCE1,TUBA8,PRKD3,ACTA1,PPP3CA,ATM,PIK3C2A,GUCY2D,GNAI1,GNAQ,GNAI2,GNAI3,ADCY9,PRKG1,TUBA1A,LPAR1
Endothelin-1 Signaling	0.002	PIK3CA,GUCY2C,PIK3R1,PRKCZ,JUN,PLCE1,LCAT,PLA2G2F,ECE2,CASQ1,PNPLA3,ECE1,GNA13,PRKD3,ATM,PLA2G12A,PIK3C2A,GUCY2D,GNAQ,GNAI1,MAPK12,GNAI2,FOS,PLA2G6,GNAI3,ADCY9,MAPK14,GAB1
SAPK/JNK Signaling	0.002	TP53,PIK3CA,PIK3C2A,NFATC3,PIK3R1,MAP3K5,MAPK12,RAC3,NFATC1,MAP3K12,TRADD,GNB3,RIPK1,JUN,GAB1,IRS1,GNA13,ATM
Ceramide Signaling	0.002	PIK3CA,PIK3C2A,PPP2R2A,PIK3R1,PRKCZ,KSR1,DIABLO,FOS,AKT1,JUN,SMPD4,NGFR,PPP2R2B,TNFRSF1B,TNF,ATM

ATM Signaling	0.002	TP53,SMC3,GADD45B,GADD45G,CBX5,MAPK12,JUN,MAPK14,SMC1B,CDKN1A,ATF4,BRCA1,ATM
Insulin Receptor Signaling	0.002	RPS6KB1,SOCS3,PIK3CA,PIK3C2A,SGK1,PIK3R1,Irs4,PPP1CB,PDPK1,PPP1R3A,STXBP4,PPP1R14B,PRKCZ,Ins1,PRKAG1,AKT1,CBL,PTPN11,GAB1,IRS1,INS,EIF2B5,ATM
Tight Junction Signaling	0.002	CPSF2,F2RL2,VTI1A,PPP2R2A,PVRL3,JAM2,NAPG,MYH11,PRKAG1,PRKCZ,AKT1,JUN,NGFR,TNFRSF1B,ACTA1,NAPB,MYH1,CSTF1,YBX3,CASK,GPA1,FOS,F11R,JAM3,PPP2R2B,INADL,TNF
PXR/RXR Activation	0.003	PPARA,SCD,CPT1A,NR3C1,Ins1,PRKAG1,GSTM2,AKT1,INS,CYP7A1,ABCB11,TNF,PPARGC1A,CYP2C8
Virus Entry via Endocytic Pathways	0.003	ITGB1,PIK3CA,PIK3C2A,ITSN1,HLA-A,PIK3R1,AP2A2,RAC3,PRKCZ,ZBTB12,ITGB4,ITGB6,CXADR,PRKD3,ACTA1,ITGB5,ATM
Germ Cell-Sertoli Cell Junction Signaling	0.003	PIK3CA,PIK3R1,PVRL3,PDPK1,MAP3K5,TUBB2B,PAK1,AKT1,TUBA8,RHOB,SORBS1,KEAP1,Map3k7,ACTA1,ATM,ITGB1,PIK3C2A,MAPK12,RAC3,PLS1,EPN2,MAP3K12,MAPK14,TUBA1A,TNF,CTNND1
GDNF Family Ligand-Receptor Interactions	0.003	PIK3CA,PSPN,PIK3C2A,GDNF,PIK3R1,GFRA2,MAPK12,FOS,JUN,GAB1,GFRA1,IRS1,RASA1,ATM
IL-1 Signaling	0.003	ECSIT,TOLLIP,GNAQ,GNAI1,MAPK12,PRKAG1,IRAK1,GNAI2,TRAF6,GNB4,FOS,GNAI3,ADCY9,MAPK14,GNB3,JUN,GNA13
PPAR α /RXR α Activation	0.003	PPARA,ADIPOQ,AP2A2,ABCA1,PRKAG1,NR2F1,HSP90B1,JUN,PLCE1,GPD2,INS,ITGB5,MED1,ACOX1,Cyp2c70,GNAQ,ACVR1,NR2C2,Cyp2c54 (includes others), TGS1,Ins1,ACVR1B,TRAF6,ADCY9,MAPK14,IRS1,PPARGC1A,CYP2C8
Estrogen-Dependent Breast Cancer Signaling	0.003	PIK3CA,HSD17B13,PIK3C2A,PIK3R1,HSD17B7,CCND1,FOS,AKT1,JUN,IGF1R,ATF4,HSD17B4,ATM
Thrombopoietin Signaling	0.003	GAB2,FOS,THPO,PIK3CA,JUN,MPL,PTPN11,PIK3C2A,PIK3R1,PRKD3,PRKCZ,ATM
NGF Signaling	0.004	TP53,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,PDPK1,MAP3K5,MAPK12,PRKCZ,TRAF6,MAP3K12,AKT1,SMPD4,PTPN11,GAB1,NGFR,ATF4,Map3k7,ATM
Cell Cycle: G2/M DNA Damage Checkpoint Regulation	0.004	TP53,KAT2B,YWHAH,CDKN1A,YWHAZ,ATR,SFN,BRCA1,PRKCZ,SKP2,ATM
Aryl Hydrocarbon Receptor Signaling	0.004	TP53,NFIC,GSTM5,MED1,TFF1,TYR,CCND1,GSTO1,NR2F1,TGM2,FOS,GSTT2/GSTT2B,HSP90B1,JUN,GSTM2,Gstm3,NFIA,CDKN1A,ATR,NRIP1,CDKN1B,TNF,ATM
NF- κ B Signaling	0.004	PIK3CA,CD40LG,PIK3R1,BMPR1B,PRKCZ,IRAK1,TRADD,AKT1,BMPR1A,NGFR,INS,IGF1R,CSNK2A1,TNFRSF1B,ATM,PIK3C2A,Ins1,DDR1,TRAF6,CSNK2A2,RIPK1,NTRK3,BCL10,TGFA,EIF2AK2,TIRAP,TNF
Cholesterol Biosynthesis	0.004	FDFT1,EBP,HSD17B7,LSS,SC5D
Thrombin Signaling	0.004	F2RL2,GATA5,PIK3CA,F2R,PIK3R1,PPP1CB,PDPK1,PRKCZ,GNB4,CAMK2D,AKT1,PLCE1,GNB3,RHOB,ARHGFE3,GNA13,PRKD3,MYL12A,ATM,RPS6KB1,PIK3C2A,GNAI1,GNAQ,MAPK12,GNAI2,ADCY9,GNAI3,MAPK14,ARHGFE16
T Helper Cell Differentiation	0.004	IL6ST,CD40LG,IL2RG,IL4R,IL10,BCL6,RORC,IL17A,CD80,NGFR,CD86,TNFRSF1B,TNF,ICOSLG/LOC102723996
Renal Cell Carcinoma Signaling	0.004	PIK3CA,PIK3C2A,PIK3R1,TCEB1,FOS,PAK1,AKT1,JUN,PTPN11,GAB1,HGF,TGFA,UBC,ATM

Reelin Signaling in Neurons	0.005	ITGB1,PAFAH1B2,PIK3CA,PIK3C2A,PIK3R1,CNR1,MAPK12,APP,APBB1,AKT1,CDK5,ARHGEF16,ARHGEF3,PAFAH1B1,ATM
Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis	0.005	IL6ST,SOCS3,PIK3CA,NFATC3,PIK3R1,CSNK1A1,WNT16,WNT8B,CCND1,PRKCZ,NFATC1,PGF,IRAK1,TRADD,CAMK2D,NLK,AKT1,JUN,PLCE1,NGFR,ATF4,TNFRSF1B,PRKD3,PPP3CA,ATM,PIK3C2A,IL10,GNAQ,TCF7L1,TCF3,IL7,IL17A,TRAF6,IL16,FOS,MAPK14,RIPK1,WNT3A,SFRP1,TNF,WNT5A
Mouse Embryonic Stem Cell Pluripotency	0.005	TP53,IL6ST,ID2,PIK3CA,PIK3C2A,PIK3R1,TCF7L1,SMAD5,MAPK12,TCF3,XIAP,MAPK14,WNT3A,AKT1,PTPN11,BMPR1A,ATM
Relaxin Signaling	0.005	PIK3CA,PIK3C2A,GUCY2C,PDE7A,GUCY2D,PIK3R1,GNAQ,GNAI1,PRKAG1,PRKCZ,PDE6H,GNAI2,GNAI3,ADCY9,FOS,GNB4,GNB3,JUN,AKT1,PDE7B,GNA13,ATM
Myc Mediated Apoptosis Signaling	0.005	TP53,PIK3CA,AKT1,YWHAE,PIK3C2A,PIK3R1,IGF1R,YWHAZ,MAPK12,SFN,PRKCZ,ATM
DNA damage-induced 14-3-3 σ Signaling	0.005	TP53,AKT1,ATR,SFN,BRCA1,ATM
STAT3 Pathway	0.006	SOCS3,SOCS6,BMPR1B,MAPK12,DDR1,MAP3K12,MAPK14,NTRK3,BMPR1A,PIM1,NGFR,CDKN1A,IGF1R,SOCS5
PI3K Signaling in B Lymphocytes	0.006	PIK3CA,IL4R,ATF3,NFATC3,PIK3R1,Irs4,PDPK1,PLEKHA4,NFATC1,PRKCZ,FOS,PLCE1,JUN,AKT1,CAMK2D,CBL,BCL10,IRS1,ATF4,PLEKHA1,PPP3CA
Folate Transformations I	0.006	MTHFD2,SHMT1,MTHFD1,SHMT2
Vitamin-C Transport	0.006	SLC23A2,SLC23A1,TXNRD1,GSTO1,TXNRD3
Tetrahydrofolate Salvage from 5,10-methenyltetrahydrofolate	0.007	MTHFD2,MTHFD1,GART
Folate Polyglutamylation	0.007	SHMT1,MTHFD1,SHMT2
Erythropoietin Signaling	0.007	RPS6KB1,SOCS3,PIK3CA,PIK3C2A,PIK3R1,PDPK1,PRKCZ,FOS,JUN,AKT1,CBL,PRKD3,ATM
Production of Nitric Oxide and Reactive Oxygen Species in Macrophages	0.007	PPARA,PIK3CA,APOA4,PPP2R2A,PIK3R1,PPP1CB,PPP1R3A,MAP3K5,PPP1R14B,PRKCZ,AKT1,JUN,RHOB,NGFR,Map3k7,SERPINA1,TNFRSF1B,PRKD3,ATM,PIK3C2A,MAPK12,MAP3K12,FOS,MAPK14,PPP2R2B,CAT,TNF
IL-2 Signaling	0.007	CSNK2A2,FOS,PIK3CA,IL2RG,AKT1,JUN,PTPN11,PIK3C2A,PIK3R1,CSNK2A1,ATM
Nitric Oxide Signaling in the Cardiovascular System	0.008	PIK3CA,PIK3C2A,GUCY2C,GUCY2D,PIK3R1,PRKG2,PRKCZ,PRKAG1,ATP2A1,PGF,HSP90B1,AKT1,PRKG1,ADRB1,CACNA1E,PRKD3,ATM
Glycine Biosynthesis I	0.008	SHMT1,SHMT2
IL-6 Signaling	0.009	IL6ST,SOCS3,PIK3CA,PIK3C2A,PIK3R1,MAPK12,TRAF6,FOS,CSNK2A2,AKT1,JUN,MAPK14,PTPN11,NGFR,CRP,CSNK2A1,TNFRSF1B,TNF,ATM
iCOS-iCOSL Signaling in T Helper Cells	0.009	GAB2,PIK3CA,CD40LG,IL2RG,PIK3C2A,NFATC3,CD4,PIK3R1,PDPK1,PLEKHA4,NFATC1,CAMK2D,AKT1,CD80,PLEKHA1,ICOSLG/LOC102723996,PPP3CA,ATM
CCR5 Signaling in Macrophages	0.009	CD4,GNAI1,MAPK12,PRKCZ,GNAI2,GNAI3,FOS,GNB4,JUN,GNB3,MAPK14,CCL4,PRKD3

Protein Ubiquitination Pathway	0.010	PSMB3,USP14,HLA-A,UBE2D2,DNAJC3,HSPA5,TCEB1,UBE2D4,USP7,HSP90B1,USP47,BRCA1,PSMB4,UBE2M,DNAJC27,USP38,PSMC4,DNAJC2,THOP1,UBE3A,UBE2L6,XIAP,SKP2,DNAJC11,TRAF6,HSPA8,ANAPC4,PSMD11,CBL,ZBTB12,UBR1,HSPB11,ANAPC5,UBC,PSMC3
IL-9 Signaling	0.010	SOCS3,PIK3CA,IL2RG,PIK3C2A,IRS1,PIK3R1,TNF,ATM
Ephrin A Signaling	0.010	PIK3CA,PAK1,PTPN11,PIK3C2A,NGFR,PIK3R1,EPHA1,EPHA5,EPHA3,ATM
CD28 Signaling in T Helper Cells	0.010	PIK3CA,PIK3C2A,NFATC3,CD4,PIK3R1,PDPK1,MAPK12,NFATC1,FOS,PAK1,ACTR3,AKT1,JUN,PTPN11,CD80,BCL10,CD86,PPP3CA,ATM
Type I Diabetes Mellitus Signaling	0.010	SOCS3,HLA-A,SOCS6,MAP3K5,MAPK12,IRAK1,TRAF6,TRADD,RIPK1,MAPK14,CD80,NGFR,INS,CD86,TNFRSF1B,TNF,SOCS5,CPE
ErbB Signaling	0.010	RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,PDPK1,MAPK12,PRKCZ,FOS,PAK1,AKT1,JUN,MAPK14,TGFA,PRKD3,ATM
ILK Signaling	0.010	PIK3CA,PPP2R2A,PIK3R1,PDPK1,MYH11,PPP1R14B,CCND1,PGF,AKT1,JUN,RHOB,ATF4,ITGB4,ITGB5,ACTA1,MYH1,ATM,ITGB1,PIK3C2A,VIM,Irs4,MAPK12,FOS,IRS1,PPP2R2B,ITGB6,TNF
Role of JAK1 and JAK3 in γ c Cytokine Signaling	0.011	IL7R,SOCS3,PIK3CA,IL2RG,IL4R,PTPN11,PIK3C2A,IRS1,PIK3R1,Irs4,IL7,ATM
Dopamine-DARPP32 Feedback in cAMP Signaling	0.011	PPP2R2A,GNAQ,CSNK1A1,GNAI1,PPP1CB,PPP1R3A,PRKG2,PPP1R14B,PRKAG1,PRKCZ,ATP2A1,GNAI2,GNAI3,ADCY9,PLCE1,PRKG1,CACNA1E,CDK5,PPP2R2B,KCNJ1,CAMKK1,ATF4,PRKD3,PPP3CA
P2Y Purigenic Receptor Signaling Pathway	0.011	PIK3CA,PIK3C2A,PIK3R1,GNAQ,GNAI1,PRKCZ,PRKAG1,GNAI2,GNB4,FOS,ADCY9,GNAI3,GNB3,PLCE1,JUN,AKT1,ATF4,PRKD3,ATM
Androgen Signaling	0.011	GNAQ,GNAI1,GTF2A1,CCND1,PRKCZ,PRKAG1,GNAI2,GNB4,GNAI3,KAT2B,POLR2A,JUN,GNB3,POLR2E,GTF2H4,GTF2H1,GNA13,PRKD3
Role of NFAT in Cardiac Hypertrophy	0.012	IL6ST,PIK3CA,PIK3R1,CSNK1A1,PRKAG1,PRKCZ,GNB4,CAMK2D,AKT1,PLCE1,GNB3,HDAC11,IGF1R,PRKD3,PPP3CA,ATM,PIK3C2A,SLC8A3,GNAI1,GNAQ,MAPK12,GNAI2,GNAI3,ADCY9,MAPK14,RCAN2
Cardiac Hypertrophy Signaling	0.012	PIK3CA,PIK3R1,MAP3K5,PRKAG1,GNB4,ADRB1,CACNA1E,AKT1,JUN,PLCE1,GNB3,RHOB,IGF1R,Map3k7,GNA13,PPP3CA,MYL12A,ATM,RPS6KB1,PIK3C2A,GNAQ,GNAI1,MAPK12,GNAI2,ADCY9,MAP3K12,GNAI3,MAPK14,ADRA2A,IRS1,EIF2B5
Melanoma Signaling	0.012	TP53,PIK3CA,AKT1,PIK3C2A,MITF,PIK3R1,CDKN1A,CCND1,ATM
UVC-Induced MAPK Signaling	0.012	TP53,FOS,JUN,MAPK14,SMPD4,ATR,MAPK12,PRKD3,PRKCZ
JAK/Stat Signaling	0.013	SOCS3,PIK3CA,PIK3C2A,PIK3R1,SOCS6,GNAQ,FOS,AKT1,JUN,PTPN11,CDKN1A,SOCS5,ATM
CTLA4 Signaling in Cytotoxic T Lymphocytes	0.013	PIK3CA,PIK3C2A,AP1M2,HLA-A,PPP2R2A,PIK3R1,AP1S2,AP2A2,AKT1,CD80,PTPN11,ZBTB12,PPP2R2B,CD86,ATM
GNRH Signaling	0.013	GNAQ,GNAI1,MAP3K5,MAPK12,PRKCZ,PRKAG1,GNAI2,FOS,ADCY9,MAP3K12,GNAI3,PAK1,MAPK14,JUN,CAMK2D,ATF4,Map3k7,DNM1L,PRKD3,GNRHR

Signaling by Rho Family GTPases	0.013	PIK3CA,PIK3R1,PRKCZ,GNB4,PAK1,STMN1,GNB3,ACTR3,JUN,RHOB,GFAP,GNA13,ARHGEF3,ACTA1,MYL12A,ATM,ITGB1,PIK3C2A,SEPT4,SEPT7,GNAQ,GNAI1,RDX,VIM,MAPK12,GNAI2,FOS,GNAI3,MAP3K12,PIP5K1A,ARHGEF16,CDH17
Purine Nucleotides De Novo Biosynthesis II	0.013	IMPDH1,PAICS,PPAT,GART
NF-κB Activation by Viruses	0.014	ITGB1,PIK3CA,PIK3C2A,CD4,PIK3R1,PRKCZ,AKT1,RIPK1,IKBKAP,EIF2AK2,PRKD3,ITGB5,ATM
Ephrin B Signaling	0.014	ITSN1,GNAI1,GNAQ,RAC3,GNAI2,GNAI3,GNB4,PAK1,GNB3,CBL,ABI1,EFNB1,GNA13
Ovarian Cancer Signaling	0.015	TP53,RPS6KB1,PMS2,PIK3CA,PIK3C2A,PIK3R1,WNT16,TCF7L1,TCF3,WNT8B,CCND1,SIN3A,PRKAG1,PGF,AKT1,WNT3A,MSH6,BRCA1,ATM,WNT5A
Ephrin Receptor Signaling	0.015	ITSN1,PTPN13,WasI,PGF,GNB4,PAK1,ACTR3,AKT1,GNB3,SORBS1,EFNB1,ATF4,GNA13,RASA1,ITGB1,EPHA1,GNAI1,GNAQ,EPHA3,RAC3,GNAI2,GNAI3,ABI1,PTPN11,EPHA5
IL-15 Signaling	0.015	PIK3CA,IL2RG,AKT1,MAPK14,PIK3C2A,PIK3R1,AXL,MAPK12,RAC3,TNF,ATM,IL17A
Amyloid Processing	0.015	CSNK2A2,AKT1,MAPK14,CDK5,CSNK2A1,CSNK1A1,BACE2,MAPK12,PRKAG1,APP
FLT3 Signaling in Hematopoietic Progenitor Cells	0.015	GAB2,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,PDPK1,MAPK12,AKT1,MAPK14,CBL,PTPN11,ATF4,ATM
Toll-like Receptor Signaling	0.015	PPARA,ECSIT,TOLLIP,MAPK12,IRAK1,TRAF6,FOS,JUN,MAPK14,EIF2AK2,TIRAP,UBC,TNF
LPS/IL-1 Mediated Inhibition of RXR Function	0.016	ECSIT,ABCG8,PPARA,GSTM5,SLC27A2,HS2ST1,ABCA1,IRAK1,GSTT2/GSTT2B,JUN,GSTM2,SCARB1,Gstm3,NGFR,CYP7A1,HS6ST2,ACSL4,ABCB11,TNFRSF1B,CPT1A,FMO2,ACOX1,SLCO1A2,GSTO1,TRAF6,CAT,TNF,ACSL1,PPARGC1A,CYP2C8
Telomerase Signaling	0.017	TP53,PIK3CA,IL2RG,PIK3C2A,PPP2R2A,PIK3R1,PDPK1,TERF2,ELF4,ELF2,HSP90B1,AKT1,HDAC11,PPP2R2B,CDKN1A,ATM
B Cell Receptor Signaling	0.017	GAB2,PIK3CA,NFATC3,PIK3R1,PDPK1,MAP3K5,BCL6,NFATC1,CAMK2D,AKT1,JUN,Map3k7,ATF4,PPP3CA,ATM,RPS6KB1,APBB1IP,PIK3C2A,TCF3,MAPK12,MAP3K12,MAPK14,PTPN11,GAB1,BCL10
Clathrin-mediated Endocytosis Signaling	0.017	PIK3CA,APOA4,F2R,PIK3R1,SH3GL2,AP2A2,PGF,ACTR3,INS,CSNK2A1,SERPINA1,ITGB4,FGF3,ITGB5,ACTA1,PPP3CA,ATM,ITGB1,PIK3C2A,HSPA8,CSNK2A2,CBL,DNM1L,UBC,ITGB6,CTTN
Cleavage and Polyadenylation of Pre-mRNA	0.019	CPSF2,PAPOLA,CSTF1,WDR33
CCR3 Signaling in Eosinophils	0.019	PIK3CA,PIK3C2A,PIK3R1,GNAI1,PPP1CB,MAPK12,PRKCZ,GNAI2,GNB4,PLA2G6,GNAI3,PAK1,MAPK14,GNB3,PLA2G2F,PRKD3,ATM,PLA2G12A
IL-4 Signaling	0.019	RPS6KB1,PIK3CA,IL2RG,IL4R,IL13RA1,PIK3C2A,NFATC3,PIK3R1,NR3C1,NFATC1,AKT1,IRS1,ATM
Wnt/β-catenin Signaling	0.019	TP53,SOX7,PPP2R2A,GNAQ,CSNK1A1,ACVR1,WNT16,TCF7L1,TCF3,WNT8B,CCND1,ACVR1B,CSNK2A2,JUN,AKT1,NLK,WNT3A,SOX6,PPP2R2B,CSNK2A1,SFRP1,UBC,WNT5A,SOX5
Fc Epsilon RI Signaling	0.020	PIK3CA,PIK3C2A,PIK3R1,PDPK1,MAPK12,RAC3,PRKCZ,PLA2G6,AKT1,MAPK14,GAB1,PLA2G2F,PTPN11,TNF,PRKD3,ATM,PLA2G12A
Superpathway of Serine and Glycine Biosynthesis I	0.020	PHGDH,SHMT1,SHMT2

Phosphatidylcholine Biosynthesis I	0.020	CHPT1,PHKA1,PCYT1A
CXCR4 Signaling	0.020	PIK3CA,PIK3C2A,CD4,PIK3R1,GNAQ,GNAI1,MAPK12,PRKCZ,GNAI2,GNB4,FOS,ADCY9,GNAI3,PAK1,GNB3,JUN,AKT1,RHOB,GNA13,PRKD3,ATM,MYL12A
PKCθ Signaling in T Lymphocytes	0.021	PIK3CA,PIK3C2A,NFATC3,CD4,PIK3R1,MAP3K5,RAC3,NFATC1,FOS,MAP3K12,CAMK2D,JUN,CD80,BCL10,CD86,Map3k7,PPP3CA,ATM
Sertoli Cell-Sertoli Cell Junction Signaling	0.021	PVRL3,JAM2,MAP3K5,PRKG2,PRKAG1,TUBB2B,AKT1,JUN,TUBA8,SORBS1,KEAP1,Map3k7,ACTA1,ITGB1,YBX3,MAPK12,PLS1,EPN2,F11R,MAP3K12,PRKG1,MAPK14,TUBA1A,JAM3,TNF
Role of Oct4 in Mammalian Embryonic Stem Cell Pluripotency	0.021	NR2F1,TP53,KDM5B,NR6A1,PCGF6,FBXO15,NR5A1,BRCA1,SALL4
Role of Tissue Factor in Cancer	0.021	TP53,ITGB1,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,GNAQ,MAPK12,F10,PAK1,AKT1,MAPK14,PTPN11,FGB,GNA13,ITGB5,ATM
Role of Pattern Recognition Receptors in Recognition of Bacteria and Viruses	0.021	PIK3CA,PIK3C2A,IL10,PIK3R1,Oas1b,IRF3,IFNA4,C1QB,OAS3,MAPK12,RNASEL,PRKCZ,IL17B,IL17A,TRAF6,EIF2AK2,TNF,PRKD3,ATM
Hepatic Cholestasis	0.022	ABCG8,PPARA,GCGR,SLCO1A2,MAPK12,PRKAG1,Ins1,PRKCZ,IRAK1,IL17B,IL17A,TRAF6,ADCY9,JUN,NGFR,ABCC1,INS,CYP7A1,ABCB11,TNFRSF1B,TIRAP,TNF,PRKD3
IL-17A Signaling in Gastric Cells	0.022	FOS,JUN,MAPK14,MAPK12,TNF,IL17A
Role of NANOG in Mammalian Embryonic Stem Cell Pluripotency	0.023	TP53,IL6ST,PIK3CA,PIK3C2A,PIK3R1,WNT16,TCF7L1,BMPR1B,SMAD5,WNT8B,WNT3A,AKT1,GAB1,BMPR1A,ATM,WNT5A,SALL4
Protein Kinase A Signaling	0.023	HIST1H1C,AKAP8,PDE7A,NFATC3,PTPN13,PPP1CB,PPP1R3A,GRK1,AKAP7,PPP1R14B,PRKAG1,NFATC1,DUSP2,PRKCZ,PHKA2,GNB4,CAMK2D,PLCE1,GNB3,PDE7B,NGFR,ATF4,GNA13,PRKD3,PPP3CA,MYL12A,PTPRE,PTPRK,YWHAZ,ADD2,GNAI1,YWHAZ,GNAQ,TCF7L1,ANAPC7,TCF3,PDE6H,GNAI2,GNAI3,ANAPC4,ADCY9,PTPN11,ANAPC5,TNNI1,SFN,EYA1,PTPN21
GM-CSF Signaling	0.023	RUNX1,PIK3CA,AKT1,CAMK2D,PTPN11,PIK3C2A,PIM1,PIK3R1,CCND1,PPP3CA,ATM
5-aminoimidazole Ribonucleotide Biosynthesis I	0.023	PPAT,GART
Cyclins and Cell Cycle Regulation	0.023	TP53,PPP2R2A,CCND1,SIN3A,SKP2,MYT1,CDKN2D,HDAC11,CDKN1A,PPP2R2B,ATR,CDKN1B,ATM
Regulation of eIF4 and p70S6K Signaling	0.025	ITGB1,RPS6KB1,PIK3CA,PIK3C2A,EIF4EBP2,PPP2R2A,PIK3R1,AGO2,PDPK1,MAPK12,PRKCZ,EIF2S2,AKT1,MAPK14,IRS1,PPP2R2B,RPS9,EIF3I,EIF2B5,ATM,RPS24
Corticotropin Releasing Hormone Signaling	0.025	GUCY2C,GUCY2D,BDNF,CNR1,GNAQ,GNAI1,MAPK12,PRKCZ,PRKAG1,GNAI2,FOS,GNAI3,ADCY9,MAPK14,JUN,ATF4,PRKD3
B Cell Activating Factor Signaling	0.026	TRAF6,FOS,JUN,MAPK14,NFATC3,IKBKAP,MAPK12,NFATC1
Neuroprotective Role of THOP1 in Alzheimer's Disease	0.026	YWHAZ,ECE2,HLA-A,ECE1,IDE,THOP1,PRKAG1,APP
Antiproliferative Role of Somatostatin Receptor 2	0.026	GNB4,PIK3CA,GNB3,GUCY2C,PTPN11,PIK3C2A,GUCY2D,PIK3R1,CDKN1A,CDKN1B,ATM

IL-3 Signaling	0.026	GAB2,FOS,PIK3CA,PAK1,AKT1,JUN,PIK3C2A,PIK3R1,PRKD3,PRKCZ,PPP3CA,ATM
IL-8 Signaling	0.027	PIK3CA,PIK3R1,CCND1,PRKCZ,IRAK1,PGF,GNB4,AKT1,JUN,GNB3,RHOB,GNA13,PRKD3,ITGB5,LASP1,ATM,RPS6KB1,PIK3C2A,GNAI1,MAPK12,RAC3,GNAI2,TRAF6,GNAI3,FOS
UVA-Induced MAPK Signaling	0.028	TP53,RPS6KB1,PIK3CA,PIK3C2A,PIK3R1,ART1,PARP3,MAPK12,FOS,JUN,PLCE1,MAPK14,SMPD4,ATM
eNOS Signaling	0.032	PIK3CA,CHRNA4,PIK3C2A,PIK3R1,GNAQ,PDPK1,AQP4,HSPA5,PRKCZ,PRKAG1,PGF,HSPA8,ADCY9,HSP90B1,AQP9,AKT1,PRKG1,LPAR1,PRKD3,ATM
LPS-stimulated MAPK Signaling	0.032	FOS,PIK3CA,PAK1,JUN,MAPK14,PIK3C2A,PIK3R1,MAP3K5,MAPK12,PRKD3,PRKCZ,ATM
CD40 Signaling	0.032	TRAF6,FOS,PIK3CA,CD40LG,JUN,MAPK14,PIK3C2A,PIK3R1,IKBKAP,MAPK12,ATM
Cardiac β -adrenergic Signaling	0.033	PDE7A,AKAP8,PPP2R2A,SLC8A3,PPP1CB,PPP1R3A,PPP1R14B,AKAP7,PRKAG1,ATP2A1,PDE6H,GNB4,ADCY9,GNB3,CACNA1E,ADRB1,PDE7B,PKIB,PPP2R2B
Synaptic Long Term Depression	0.033	GUCY2C,GUCY2D,PPP2R2A,GNAQ,GNAI1,PRKG2,PRKCZ,GNAI2,PLA2G6,GNAI3,PRKG1,PLCE1,PLA2G2F,LCAT,PPP2R2B,IGF1R,PNPLA3,GNA13,PRKD3,PLA2G12A
Prostate Cancer Signaling	0.034	TP53,PIK3CA,PIK3C2A,PIK3R1,PDPK1,CCND1,SIN3A,HSP90B1,AKT1,CDKN1A,ATF4,CDKN1B,ATM
Glucocorticoid Receptor Signaling	0.034	PIK3CA,NFATC3,SGK1,PIK3R1,KRT32,TAF10,HSPA5,GTF2A1,NR3C1,NFATC1,PRKAG1,CXCL3,HSP90B1,JUN,AKT1,POLR2A,KAT2B,PPP3CA,ATM,PIK3C2A,MED1,IL10,MAPK12,HSPA8,TRAF6,FOS,MAPK14,POLR2E,GTF2H4,CDKN1A,GTF2H1,NRIP1,TNF
Leptin Signaling in Obesity	0.035	SOCS3,ADCY9,PIK3CA,AKT1,PLCE1,PTPN11,PIK3C2A,PIK3R1,INS,AGRP,PRKAG1,ATM
Human Embryonic Stem Cell Pluripotency	0.035	PIK3CA,PIK3C2A,BDNF,PIK3R1,ACVR1,PDPK1,WNT16,SMAD5,TCF7L1,TCF3,WNT8B,WNT3A,AKT1,BMPR1A,NTRK3,LEFTY1,ATM,WNT5A,SALL4
Xenobiotic Metabolism Signaling	0.035	PIK3CA,GSTM5,PPP2R2A,PIK3R1,HS2ST1,GCLC,MAP3K5,PRKCZ,GSTT2/GSTT2B,HSP90B1,GSTM2,CAMK2D,CES1,Gstm3,KEAP1,HS6ST2,Map3k7,PRKD3,ATM,PIK3C2A,FMO2,MED1,UGT8,MAPK12,GSTO1,Ces1e,MAP3K12,MAPK14,PPP2R2B,CAT,NRIP1,TNF,PPARGC1A,CYP2C8
Role of PI3K/AKT Signaling in the Pathogenesis of Influenza	0.035	GNAI2,KNNA3,GNAI3,PIK3CA,AKT1,PIK3C2A,PIK3R1,GNAI1,IFNA4,IRF3,ATM
IL-17A Signaling in Fibroblasts	0.036	TRAF6,FOS,JUN,MAPK14,MAPK12,NFKBIZ,IL17A
Role of JAK2 in Hormone-like Cytokine Signaling	0.036	SOCS3,PTPN11,IRS1,SOCS6,Irs4,PRLR,SOCS5
Stearate Biosynthesis I (Animals)	0.036	Ces1e,SLC27A2,CYP2E1,ACSL4,ACSL1,ACOT8,ELOVL6
Nucleotide Excision Repair Pathway	0.036	ERCC4,POLR2A,GTF2H4,POLR2E,GTF2H1,ERCC5,XPA
Endoplasmic Reticulum Stress Pathway	0.037	HSP90B1,DNAJC3,ATF4,MAP3K5,HSPA5
Role of NFAT in Regulation of the Immune Response	0.038	PIK3CA,PIK3C2A,NFATC3,PIK3R1,CD4,GNAQ,CSNK1A1,GNAI1,NFATC1,GNAI2,GNB4,FOS,GNAI3,GNB3,JUN,AKT1,CD80,CD86,IKBKAP,GNA13,RCAN2,PPP3CA,ATM

Sphingosine-1-phosphate Signaling	0.038	PIK3CA,PIK3C2A,PIK3R1,GNAQ,GNAI1,ASAH2,GNAI2,GNAI3,ADCY9,AKT1,PLCE1,RHOB,SMPD4,CASQ1,GNA13,ATM
Methylglyoxal Degradation III	0.042	AKR1B10,CYP2E1,AKR1B1,Akr1b7
VEGF Family Ligand-Receptor Interactions	0.042	PLA2G6,FOS,PIK3CA,AKT1,PLA2G2F,PIK3C2A,PIK3R1,PRKD3,PRKCZ,PGF,ATM,PLA2G12A
Heme Biosynthesis II	0.042	ALAD,ALAS2,CPOX
Ketolysis	0.042	HADHB,BDH1,OXCT1
Remodeling of Epithelial Adherens Junctions	0.043	ACTR3,RALA,TUBA1A,TUBA8,MAPRE1,HGF,CBLL1,DNM1L,ACTA1,TUBB2B,CTNND1
FGF Signaling	0.044	PIK3CA,PIK3C2A,PIK3R1,MAP3K5,MAPK12,AKT1,MAPK14,PTPN11,GAB1,HGF,ATF4,FGF3,ATM
Myo-inositol Biosynthesis	0.044	IMPA1,IMPAD1
Cellular Effects of Sildenafil (Viagra)	0.046	SLC4A5,GUCY2C,GUCY2D,CACNG4,PPP1CB,PRKG2,MYH11,PRKAG1,ADCY9,CACNA1E,PRKG1,PLCE1,KCNQ2,CACNG7,CACNG8,ACTA1,MYH1,MYL12A
PPAR Signaling	0.046	PPARA,MED1,Ins1,TRAF6,NR2F1,FOS,HSP90B1,JUN,NGFR,INS,NRIP1,TNFRSF1B,TNF,PPARGC1A
Acute Myeloid Leukemia Signaling	0.046	RUNX1,RPS6KB1,PIK3CA,AKT1,PIK3C2A,PIM1,PIK3R1,TCF7L1,TCF3,CCND1,CSF1R,ATM
Axonal Guidance Signaling	0.048	ITSN1,NFATC3,PIK3R1,Wasl,WNT16,GNB4,PAK1,PLCE1,GNB3,ECE2,GNA13,PRKD3,RASA1,ATM,EPHA1,RAC3,SRGAP3,PTPN11,PIK3CA,BDNF,WNT8B,PRKAG1,ADAM21,SEMA6C,PRKCZ,NFATC1,TUBB2B,PGF,AKT1,ACTR3,TUBA8,CDK5,NGFR,EFNB1,PFN2,PPP3CA,MYL12A,ITGB1,PLXNC1,PIK3C2A,GNAI1,GNAQ,EPHA3,GNAI2,GNAI3,TUBA1A,WNT3A,NTRK3,EPHA5,WNT5A
Glioma Signaling	0.049	TP53,PIK3CA,PIK3C2A,PIK3R1,CCND1,PRKCZ,SIN3A,CDKN2D,AKT1,CAMK2D,CDKN1A,IGF1R,PRKD3,ATM

SDC TABLE 3. Comparison analysis for acute phase response signaling pathway genes between EVLP vs. CSP and EVLP+ATL1223 vs. CSP.

Gene symbol	Entrez Gene Name	Affymetrix identifier		Gene expression value	
		EVLP vs. CSP (probeset)	EVLP+ATL vs. CSP (probeset)	EVLP vs. CSP (fold change)	EVLP+ATL vs. CSP (fold change)
NR3C1	nuclear receptor subfamily 3, group C, member 1 (glucocorticoid receptor)	1421866_at	1421866_at	-1.600	-1.789
PTPN11	protein tyrosine phosphatase, non-receptor type 11	--	1427699_a_at	--	-1.710
MAP3K5	mitogen-activated protein 3 kinase 5	--	1421340_at	--	-1.585
CP	ceruloplasmin (ferroxidase)	--	1417496_at	--	-1.565
PDPK1	3-phosphoinositide dependent protein kinase 1	--	1416501_at	--	-1.540
SOCS5	suppressor of cytokine signaling 5	--	1423350_at	--	-1.533
NOLC1	Nucleolar and coiled-body	1450087_a_at	1450087_a_at	-1.395	-1.509
IL6ST	interleukin 6 signal transducer	1421239_at	1421239_at	-1.599	-1.454
MAPK12	mitogen-activated protein kinase 12	--	1449283_a_at	--	-1.445
KLKB1	kallikrein B, plasma (Fletcher factor) 1	1449034_at	1449034_at	-1.464	-1.386
TCF3	transcription factor 3	1452542_x_at	1452542_x_at	-1.352	-1.339
TRADD	TNFRSF1A-associated via death domain	--	1429117_at	--	-1.335
AKT1	v-akt murine thymoma viral oncogene homolog 1	--	1425711_a_at	--	-1.317
RIPK1	receptor (TNFRSF)-interacting serine-threonine kinase 1	--	1419508_at	--	-1.314
TRAF6	TNF receptor-associated factor 6, E3 ubiquitin protein ligase	1435350_at	1435350_at	-1.344	-1.307
MAP3K7	mitogen-activated protein 3 kinase 7	--	1425795_a_at	--	-1.283
PIK3R1	phosphoinositide-3-kinase, regulatory subunit 1 (alpha)	1451737_at	1451737_at	-1.318	-1.303
PIK3CA	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit alpha	1460326_at	1460326_at	-1.207	-1.247
SOCS6	suppressor of cytokine signaling 6	1450129_a_at	1450129_a_at	-1.227	-1.241
ECSIT	ECSIT signalling integrator	--	1417080_a_at	--	-1.207
IRAK1	interleukin-1 receptor-associated kinase 1	--	1460649_at	--	-1.184

SERPINA1	serpin peptidase inhibitor, clade A (alpha-1 antiproteinase, antitrypsin), member 1	1418282_x_at	1418282_x_at	1.418	1.294
NGFR	nerve growth factor receptor	--	1454903_at	--	1.301
FGB	fibrinogen beta chain	1428079_at	1428079_at	1.388	1.365
TNFRSF1B	tumor necrosis factor receptor superfamily, member 1B	1448951_at	1448951_at	1.327	1.367
CRP	C-reactive protein, pentraxin-related	1421946_at	1421946_at	1.617	1.448
MAPK14	mitogen-activated protein kinase 14	--	1426104_at	--	1.483
SAA1	serum amyloid A1	1449326_x_at	1449326_x_at	1.565	1.558

A descriptive list of genes associated with the acute phase response signaling canonical pathway between group comparisons is shown. The number of genes down-regulated (negative fold change) in the EVLP+ALT1223 (EVLP+ATL) vs. CSP (cold static preservation) comparison is higher than the EVLP vs. CSP comparison.