Supplemental Methods

Laboratory measurements

Clinical laboratory procedures were described in detail previously[S1, S2]. Briefly, participants were examined in the morning after an overnight fast. Urine creatinine was measured by a modified Jaffé reaction, and urinary albumin by nephelometric immunoassay. Any albumin concentrations below the detection threshold of 6.8 mg/L were set to 6.8 mg/L in the analyses.

GFR was measured by the urinary clearance of non-radioactive iothalamate[S3]. Diuresis was initiated by an oral water load after the bladder was emptied. A loading dose of 300 mg iothalamate plus 3 mg/kg for each 1 kg >100 kg was given intravenously, followed by a continuous infusion to maintain a constant serum concentration. After equilibration, four serum and urine samples were collected at 20-minute intervals and were frozen at −80°C until the day of assay. Iothalamate concentrations in these samples were measured by high-performance liquid chromatography (Waters, Milford, MA).

RNA sequencing

A GeneChip Human Genome series U133A and Plus 2.0 Array (Affymetrix, Santa Clara, CA) was used for gene expression profiling, and the resulting image files were obtained, processed, and normalized using quantile normalization in the Robust Multi Array Average method as implemented in the Affy package[S4]. We used a Bayesian method, COMBAT, for correcting batch effects in the gene expression data[S5]. Batch corrected log2 transformed data were used for all the downstream computational analyses.

WGCNA Analysis

Pairwise Pearson correlations among all the genes in the expression matrix were computed. Modules (groups) of highly interconnected genes were constructed from a topological overlap matrix and hierarchical clustering. An eigen gene, a vector that summarizes the expression of all genes in that module akin to PC1, was constructed for all the modules. The modules whose eigen genes were highly correlated were merged. After an iterative process the gene expression matrix was reduced to co-expression modules.

ScRNAseq cohort

An independent group of Pima Indians was used in this analysis because scRNAseq was not available when the biopsies were performed on the 52 participants in the primary analysis described above. Since the 44 individuals whose kidney tissue was assessed by scRNAseq were recently enrolled in the study, they do not have sufficient follow-up to characterize their GFR trajectories. Mean age of this single cell cohort of Pima Indians was 41.0±11.1 years, diabetes duration was 12.2±7.5 years, GFR was 159±58 ml/min, and median ACR was 18 (9, 48) mg/g.

Supplemental References

S1. Nelson RG, Bennett PH, Beck GJ*, et al.* Development and progression of renal disease in Pima Indians with non-insulin-dependent diabetes mellitus. Diabetic Renal Disease Study Group. *N Engl J Med* 1996; **335:** 1636-1642.

S2. Weil EJ, Fufaa G, Jones LI*, et al.* Effect of losartan on prevention and progression of early diabetic nephropathy in American Indians with type 2 diabetes. *Diabetes* 2013; **62:** 3224-3231.

S3. Myers BD, Nelson RG, Tan M*, et al.* Progression of overt nephropathy in non-insulin-dependent diabetes. *Kidney Int* 1995; **47:** 1781-1789.

S4. Nair V, Komorowsky CV, Weil EJ*, et al.* A molecular morphometric approach to diabetic kidney disease can link structure to function and outcome. *Kidney Int* 2018; **93:** 439-449.

S5. Johnson WE, Li C, Rabinovic A. Adjusting batch effects in microarray expression data using empirical Bayes methods. *Biostatistics* 2007; **8:** 118-127.

Supplemental Table S1: Clinical and morphometric measurements comparing the participants included in the study (peak GFR at or after kidney biopsy) and those who were excluded because their peak GFR occurred < 2 years before the kidney biopsy

Characteristic	Included (n=52)	Excluded (n=32)	p-value
Male sex (%)	10 (19.2%)	10 (31.3%)	0.21
Age (years)	44.7 ± 10.3	48.9 ± 9.2	0.07
Diabetes duration (years)	13.4 ± 4.0	18.6 ± 7.4	<0.001
BMI (kg/m^2)	37.1 ± 8.5	35.5 ± 7.8	0.40
Systolic blood pressure (mmHg)	121 ± 8	122 ± 12	0.55
Diastolic blood pressure (mmHg)	76 ± 5	77 ± 6	0.39
HbA1c (%)	9.3 ± 2.0	9.1 ± 1.6	0.67
GFR (ml/min)	163 ± 44	137 ± 40	0.007
ACR (mg/g)	32 (14-71)	21 (11-71)	0.57
RAS use (%)	38 (73.1%)	27 (84.4%)	0.23
Mean glomerular volume (10^6 μm^3)	2.38 ± 0.72*	2.27 ± 0.74†	0.49
Glomerular basement membrane width (nm)	456 ± 86	458 ± 93	0.92
Mesangial fractional volume per glomerulus (%)	0.25 ± 0.06	0.27 ± 0.06	0.23
Cortical interstitial fractional volume (%)	0.18 ± 0.04‡	0.19 ± 0.05†	0.07
Glomerular filtration surface density ($\mu m^2/\mu m^3$)	0.11 ± 0.04	0.10 ± 0.03	0.27
Foot process width (nm)	740 (634, 1014)	768 (575, 1000)	0.55
Glomerular podocyte fractional volume (%)	0.17 ± 0.05	0.14 ± 0.04	0.032
Polocyte number density per glomerulus (10^6 μm^3)	139 ± 72	144 ± 90	0.76
Fenestrated endothelium (%)	44.0 ± 19.1	44.4 ± 16.4	0.92

Values are means ± standard deviation or median (interquartile range).
Abbreviations: ACR = albumin:creatinine ratio; BMI = body mass index; GBM = glomerular basement membrane; GFR = glomerular filtration rate; RAS = renin angiotensin system blockers.
*n=46, †n=31, ‡n=49
p-value for differences between groups based on *t*-test for continuous variables and chi square for categorical variables. ACR and foot process width were log transformed prior to analysis.

Supplemental Table S2: Timing of peak measured GFR compared to timing of peak eGFR in relation to kidney biopsy

		Timing of peak eGFR		
		>2 years before biopsy	Within 2 years of biopsy	>2 years after biopsy
Timing of peak measured GFR	>2 years before biopsy	31	0	1
	Within 2 years of biopsy	22	1	3
	>2 years after biopsy	18	3	5

Abbreviations: GFR = glomerular filtration rate directly measured with iothalamate clearance; eGFR = estimated glomerular filtration rate calculated using the CKD-epi equation ($eGFR = 141 \times \min(Scr/k)^{\alpha} \times \max(Scr/k)^{-1.209} \times 0.993^{Age} \times 1.018$ (if female). For males k = 0.9 and α = -0.411; for females k = 0.7 and α = -0.329.

Supplemental Table S3: Clinical and morphometric measures at the time of biopsy for the subset of participants with gene expression data compared to those without expression data

Characteristic	No expression data (n=23)	Expression data (n=29)	*p*-value
Male sex (%)	6 (26.1%)	4 (13.8%)	0.21
Age (years)	49.1 ± 10.8	41.2 ± 8.6	0.005
Diabetes duration (years)	15.0 ± 4.6	12.2 ± 2.9	0.016
BMI (kg/m^2)	36.5 ± 6.6	37.5 ± 9.9	0.66
Systolic blood pressure (mmHg)	123 ± 6	119 ± 9	0.09
Diastolic blood pressure (mmHg)	76 ± 5	76 ± 5	0.58
HbA1c (%)	9.1 ± 2.0	9.4 ± 2.0	0.63
GFR (ml/min)	160 ± 46	165 ± 42	0.65
ACR (mg/g)	36 (11, 68)	31 (18, 73)	0.65
RAS use (%)	16 (69.6%)	22 (75.9%)	0.23
Mean glomerular volume (10^6 μm^3)	2.40 ± 0.76*	2.37 ± 0.70†	0.92
Glomerular basement membrane width (nm)	460 ± 663	452 ± 100	0.74
Mesangial fractional volume per glomerulus (%)	0.26 ± 0.06	0.25 ± 0.05	0.52
Cortical interstitial fractional volume (%)	0.18 ± 0.04‡	0.17 ± 0.03§	0.51
Glomerular filtration surface density ($\mu m^2/\mu m^3$)	0.13 ± 0.05	0.10 ± 0.02	0.021
Foot process width (nm)	777 (696, 1030)	716 (564, 908)	0.28
Glomerular podocyte fractional volume (%)	0.17 ± 0.04	0.16 ± 0.06	0.55
Podocyte number density per glomerulus (10^6 μm^3)	130 ± 69	145 ± 74	0.44
Fenestrated endothelium (%)	35.8 ± 17.3	50.5 ± 18.2	0.005

Values are means ± standard deviation or median (interquartile range).
Abbreviations: ACR = albumin:creatinine ratio; BMI = body mass index; GBM = glomerular basement membrane; GFR = glomerular filtration rate; RAS = renin angiotensin system blockers.
*n=21, †n=25, ‡n=22, §n=27
p-value for differences between groups based on t-test for continuous variables and chi square for categorical variables. ACR and foot process width were log transformed prior to analysis.

Supplemental Table S4: Clinical and morphometric measures at the time of biopsy by peak measured GFR group for the subset of participants with gene expression data

Characteristic	Hyperfiltration after biopsy (n=15)	Hyperfiltration at biopsy (n=14)	*p*-value
Male sex (%)	3 (20.0%)	1 (7.1%)	0.32
Age (years)	42.7 ± 6.7	39.7 ± 10.2	0.36
Diabetes duration (years)	11.5 ± 2.6	12.9 ± 3.1	0.19
BMI (kg/m^2)	36.2 ± 9.6	38.9 ± 10.3	0.47
Systolic blood pressure (mmHg)	118 ± 9	121 ± 10	0.36
Diastolic blood pressure (mmHg)	75 ± 5	77 ± 4	0.09
HbA1c (%)	8.5 ± 1.9	10.4 ± 1.6	0.006
GFR (ml/min)	152 ± 36	180 ± 44	0.07
ACR (mg/g)	24 (13, 42)	51 (23, 77)	0.05
RAS use (%)	14 (93.3%)	8 (57.1%)	0.035
Mean glomerular volume (10^6 μm^3)	2.13 ± 0.69*	2.60 ± 0.6†	0.09
Glomerular basement membrane width (nm)	422 ± 93	485 ± 101	0.09
Mesangial fractional volume per glomerulus (%)	0.23 ± 0.05	0.27 ± 0.05	0.06
Cortical interstitial fractional volume (%)	0.17 ± 0.02*	0.18 ± 0.04	0.41
Glomerular filtration surface density ($\mu m^2/\mu m^3$)	0.10 ± 0.02	0.10 ± 0.02	0.61
Foot process width (nm)	713 (560, 908)	747 (564, 916)	0.96
Glomerular podocyte fractional volume (%)	0.18 ± 0.07	0.15 ± 0.03	0.11
Podocyte number density per glomerulus (10^6 μm^3)	181 ± 81	108 ± 43	0.006
Fenestrated endothelium (%)	51.0 ± 16.0	49.8 ± 21.0	0.85

Values are means ± standard deviation or median (interquartile range).
Abbreviations: ACR = albumin:creatinine ratio; BMI = body mass index; GBM = glomerular basement membrane; GFR = glomerular filtration rate; RAS = renin angiotensin system blockers.
*n=13, †n=12
p-value for differences between groups based on t-test for continuous variables and chi square for categorical variables except for RAS use which was compared by Fisher's exact test. ACR and foot process width were log transformed prior to analysis.

Supplemental Table S5: Complete list of genes in the three WGCNA modules where 95% genes (1240 genes) were upregulated in the HF compared to pre-HF group

GeneID	*Symbol*	ModuleAssignment
10112	*KIF20A*	midnightblue
2146	*EZH2*	midnightblue
8838	*WISP3*	midnightblue
1356	*CP*	midnightblue
59	*ACTA2*	midnightblue
2305	*FOXM1*	midnightblue
9173	*IL1RL1*	midnightblue
9180	*OSMR*	midnightblue
79727	*LIN28A*	midnightblue
5118	*PCOLCE*	midnightblue
79908	*BTNL8*	midnightblue
10095	*ARPC1B*	midnightblue
79690	*GAL3ST4*	midnightblue
7153	*TOP2A*	midnightblue
55872	*PBK*	midnightblue
391020	*LOC391020*	midnightblue
3240	*HP*	midnightblue
70	*ACTC1*	midnightblue
10633	*RASL10A*	midnightblue
4609	*MYC*	midnightblue
79850	*FAM57A*	midnightblue
332	*BIRC5*	midnightblue
6241	*RRM2*	midnightblue
80774	*LIMD2*	midnightblue
1844	*DUSP2*	midnightblue
11065	*UBE2C*	midnightblue
50619	*DEF6*	midnightblue
7447	*VSNL1*	midnightblue
79075	*DSCC1*	midnightblue
51514	*DTL*	midnightblue
253982	*ASPHD1*	midnightblue
57706	*DENND1A*	midnightblue
81930	*KIF18A*	midnightblue
29902	*FAM216A*	midnightblue
10205	*MPZL2*	midnightblue
12	*SERPINA3*	midnightblue

9133	*CCNB2*	midnightblue
51274	*KLF3*	midnightblue
952	*CD38*	midnightblue
57556	*SEMA6A*	midnightblue
2004	*ELK3*	midnightblue
2242	*FES*	midnightblue
9181	*ARHGEF2*	midnightblue
4240	*MFGE8*	midnightblue
841	*CASP8*	midnightblue
55240	*STEAP3*	midnightblue
55711	*FAR2*	midnightblue
5939	*RBMS2*	midnightblue
79955	*PDZD7*	midnightblue
8605	*PLA2G4C*	midnightblue
995	*CDC25C*	midnightblue
84444	*DOT1L*	midnightblue
6362	*CCL18*	midnightblue
27036	*SIGLEC7*	midnightblue
10785	*WDR4*	midnightblue
4615	*MYD88*	midnightblue
6489	*ST8SIA1*	midnightblue
6509	*SLC1A4*	midnightblue
11254	*SLC6A14*	midnightblue
79668	*PARP8*	midnightblue
10246	*SLC17A2*	midnightblue
4313	*MMP2*	midnightblue
56886	*UGGT1*	midnightblue
79683	*ZDHHC14*	midnightblue
51564	*HDAC7*	midnightblue
3978	*LIG1*	midnightblue
10493	*VAT1*	midnightblue
80765	*STARD5*	midnightblue
58189	*WFDC1*	midnightblue
80111	*C3orf36*	midnightblue
51291	*GMIP*	midnightblue
54498	*SMOX*	midnightblue
27185	*DISC1*	midnightblue
9138	*ARHGEF1*	midnightblue
1788	*DNMT3A*	midnightblue
7052	*TGM2*	midnightblue
3801	*KIFC3*	midnightblue

4314	*MMP3*	midnightblue
55190	*NUDT11*	midnightblue
81029	*WNT5B*	midnightblue
9997	*SCO2*	midnightblue
1949	*EFNB3*	midnightblue
54187	*NANS*	midnightblue
7042	*TGFB2*	midnightblue
10799	*RPP40*	midnightblue
7903	*ST8SIA4*	midnightblue
3710	*ITPR3*	midnightblue
400506	*KNOP1*	midnightblue
7408	*VASP*	midnightblue
8988	*HSPB3*	midnightblue
3003	*GZMK*	midnightblue
5155	*PDGFB*	midnightblue
6134	*RPL10*	midnightblue
53820	*RIPPLY3*	midnightblue
80868	*HCG4B*	midnightblue
51332	*SPTBN5*	midnightblue
80256	*FAM214B*	midnightblue
10287	*RGS19*	midnightblue
5371	*PML*	midnightblue
6533	*SLC6A6*	midnightblue
6503	*SLA*	midnightblue
9645	*MICAL2*	midnightblue
79047	*KCTD15*	midnightblue
57596	*BEGAIN*	midnightblue
4066	*LYL1*	midnightblue
1263	*PLK3*	midnightblue
9219	*MTA2*	midnightblue
2319	*FLOT2*	midnightblue
1302	*COL11A2*	midnightblue
79847	*TMEM180*	midnightblue
2000	*ELF4*	midnightblue
7004	*TEAD4*	midnightblue
22839	*DLGAP4*	midnightblue
5055	*SERPINB2*	midnightblue
23166	*STAB1*	midnightblue
843	*CASP10*	midnightblue
5979	*RET*	midnightblue
11186	*RASSF1*	midnightblue

79825	*EFCC1*	midnightblue
79879	*CCDC134*	midnightblue
63940	*GPSM3*	midnightblue
57172	*CAMK1G*	midnightblue
5365	*PLXNB3*	midnightblue
2245	*FGD1*	midnightblue
11182	*SLC2A6*	midnightblue
84823	*LMNB2*	midnightblue
990	*CDC6*	midnightblue
29781	*NCAPH2*	midnightblue
7010	*TEK*	midnightblue
23329	*TBC1D30*	midnightblue
604	*BCL6*	midnightblue
1841	*DTYMK*	midnightblue
2077	*ERF*	midnightblue
55320	*MIS18BP1*	midnightblue
8091	*HMGA2*	midnightblue
639	*PRDM1*	midnightblue
9344	*TAOK2*	midnightblue
489	*ATP2A3*	midnightblue
10556	*RPP30*	midnightblue
7873	*MANF*	midnightblue
11156	*PTP4A3*	midnightblue
81544	*GDPD5*	midnightblue
79905	*TMC7*	midnightblue
4776	*NFATC4*	midnightblue
64748	*LPPR2*	midnightblue
28985	*MCTS1*	midnightblue
55850	*USE1*	midnightblue
8884	*SLC5A6*	midnightblue
9948	*WDR1*	midnightblue
55357	*TBC1D2*	midnightblue
22808	*MRAS*	midnightblue
29780	*PARVB*	midnightblue
6929	*TCF3*	midnightblue
50515	*CHST11*	midnightblue
5130	*PCYT1A*	midnightblue
79901	*CYBRD1*	midnightblue
3603	*IL16*	midnightblue
91300	*R3HDM4*	midnightblue
11339	*OIP5*	midnightblue

920	*CD4*	midnightblue
7857	*SCG2*	midnightblue
10184	*LHFPL2*	midnightblue
4058	*LTK*	midnightblue
5916	*RARG*	midnightblue
23351	*KHNYN*	midnightblue
5993	*RFX5*	midnightblue
7083	*TK1*	midnightblue
57333	*RCN3*	midnightblue
2331	*FMOD*	midnightblue
79927	*FAM110D*	midnightblue
2788	*GNG7*	midnightblue
7299	*TYR*	midnightblue
79682	*CENPU*	midnightblue
4858	*NOVA2*	midnightblue
55223	*TRIM62*	midnightblue
4899	*NRF1*	midnightblue
309	*ANXA6*	midnightblue
5742	*PTGS1*	midnightblue
3111	*HLA-DOA*	midnightblue
3910	*LAMA4*	midnightblue
25806	*VAX2*	midnightblue
9466	*IL27RA*	midnightblue
8310	*ACOX3*	midnightblue
7127	*TNFAIP2*	midnightblue
1606	*DGKA*	midnightblue
1789	*DNMT3B*	midnightblue
5600	*MAPK11*	midnightblue
5675	*PSG6*	midnightblue
100	*ADA*	midnightblue
393	*ARHGAP4*	midnightblue
56548	*CHST7*	midnightblue
26508	*HEYL*	midnightblue
141	*ADPRH*	midnightblue
2494	*NR5A2*	midnightblue
8038	*ADAM12*	midnightblue
408	*ARRB1*	midnightblue
90379	*DCAF15*	midnightblue
55188	*RIC8B*	midnightblue
83448	*PUS7L*	midnightblue
8874	*ARHGEF7*	midnightblue

57118	*CAMK1D*	midnightblue
863	*CBFA2T3*	midnightblue
79159	*NOL12*	midnightblue
29109	*FHOD1*	midnightblue
51559	*NT5DC3*	midnightblue
1183	*CLCN4*	midnightblue
11169	*WDHD1*	midnightblue
5271	*SERPINB8*	midnightblue
50488	*MINK1*	midnightblue
23452	*ANGPTL2*	midnightblue
6574	*SLC20A1*	midnightblue
83729	*INHBE*	midnightblue
4741	*NEFM*	midnightblue
8882	*ZPR1*	midnightblue
56882	*CDC42SE1*	midnightblue
9013	*TAF1C*	midnightblue
84617	*TUBB6*	midnightblue
3455	*IFNAR2*	midnightblue
1445	*CSK*	midnightblue
3574	*IL7*	midnightblue
8940	*TOP3B*	midnightblue
8515	*ITGA10*	midnightblue
22846	*VASH1*	midnightblue
9057	*SLC7A6*	midnightblue
11230	*PRAF2*	midnightblue
51755	*CDK12*	midnightblue
7040	*TGFB1*	midnightblue
3227	*HOXC11*	midnightblue
10046	*MAMLD1*	midnightblue
4828	*NMB*	midnightblue
23604	*DAPK2*	midnightblue
8751	*ADAM15*	midnightblue
399664	*MEX3D*	midnightblue
4650	*MYO9B*	midnightblue
5423	*POLB*	midnightblue
1774	*DNASE1L1*	midnightblue
26097	*CHTOP*	midnightblue
114899	*C1QTNF3*	midnightblue
11064	*CNTRL*	midnightblue
4093	*SMAD9*	midnightblue
54908	*SPDL1*	midnightblue

2035	*EPB41*	midnightblue
3191	*HNRNPL*	midnightblue
602	*BCL3*	midnightblue
79838	*TMC5*	midnightblue
6103	*RPGR*	midnightblue
983	*CDK1*	midnightblue
29094	*LGALSL*	midnightblue
10533	*ATG7*	midnightblue
2275	*FHL3*	midnightblue
10750	*GRAP*	midnightblue
4957	*ODF2*	midnightblue
9928	*KIF14*	midnightblue
865	*CBFB*	midnightblue
7450	*VWF*	midnightblue
11165	*NUDT3*	midnightblue
577	*ADGRB3*	midnightblue
55117	*SLC6A15*	midnightblue
79778	*MICALL2*	midnightblue
9020	*MAP3K14*	midnightblue
79870	*BAALC*	midnightblue
81605	*URM1*	midnightblue
6491	*STIL*	midnightblue
2717	*GLA*	midnightblue
775	*CACNA1C*	midnightblue
55621	*TRMT1*	midnightblue
79899	*PRR5L*	midnightblue
64761	*PARP12*	midnightblue
54840	*APTX*	midnightblue
10195	*ALG3*	midnightblue
65012	*SLC26A10*	midnightblue
85377	*MICALL1*	midnightblue
23180	*RFTN1*	midnightblue
80169	*CTC1*	midnightblue
10460	*TACC3*	midnightblue
84722	*PSRC1*	midnightblue
55966	*AJAP1*	midnightblue
8795	*TNFRSF10B*	midnightblue
3339	*HSPG2*	midnightblue
54478	*FAM64A*	midnightblue
949	*SCARB1*	midnightblue
10312	*TCIRG1*	midnightblue

2634	*GBP2*	midnightblue
23467	*NPTXR*	midnightblue
3832	*KIF11*	midnightblue
9363	*RAB33A*	midnightblue
6659	*SOX4*	midnightblue
4815	*NINJ2*	midnightblue
25802	*LMOD1*	midnightblue
57099	*AVEN*	midnightblue
25796	*PGLS*	midnightblue
10535	*RNASEH2A*	midnightblue
8450	*CUL4B*	midnightblue
3592	*IL12A*	midnightblue
51067	*YARS2*	midnightblue
54674	*LRRN3*	midnightblue
26032	*SUSD5*	midnightblue
53346	*TM6SF1*	midnightblue
1259	*CNGA1*	midnightblue
11013	*TMSB15A*	midnightblue
9263	*STK17A*	midnightblue
55143	*CDCA8*	midnightblue
4900	*NRGN*	midnightblue
27351	*DESI1*	midnightblue
3460	*IFNGR2*	midnightblue
4057	*LTF*	midnightblue
5026	*P2RX5*	midnightblue
578	*BAK1*	midnightblue
1663	*DDX11*	midnightblue
29015	*SLC43A3*	midnightblue
4794	*NFKBIE*	midnightblue
9134	*CCNE2*	midnightblue
313	*AOAH*	midnightblue
5873	*RAB27A*	midnightblue
8349	*HIST2H2BE*	midnightblue
3620	*IDO1*	midnightblue
10643	*IGF2BP3*	midnightblue
1290	*COL5A2*	midnightblue
8821	*INPP4B*	midnightblue
22943	*DKK1*	midnightblue
7941	*PLA2G7*	midnightblue
10801	*SEPTIN9*	midnightblue
28442	*IGHV3-23*	red

81831	*NETO2*	red
6876	*TAGLN*	red
929	*CD14*	red
9314	*KLF4*	red
57016	*AKR1B10*	red
51299	*NRN1*	red
7805	*LAPTM5*	red
3059	*HCLS1*	red
7852	*CXCR4*	red
55340	*GIMAP5*	red
54541	*DDIT4*	red
6578	*SLCO2A1*	red
1901	*S1PR1*	red
3122	*HLA-DRA*	red
8692	*HYAL2*	red
2167	*FABP4*	red
5328	*PLAU*	red
5552	*SRGN*	red
8322	*FZD4*	red
1051	*CEBPB*	red
8516	*ITGA8*	red
4629	*MYH11*	red
51296	*SLC15A3*	red
355	*FAS*	red
3428	*IFI16*	red
6376	*CX3CL1*	red
390	*RND3*	red
4811	*NID1*	red
54517	*PUS7*	red
595	*CCND1*	red
11067	*C10orf10*	red
3185	*HNRNPF*	red
8291	*DYSF*	red
185	*AGTR1*	red
3115	*HLA-DPB1*	red
6507	*SLC1A3*	red
26207	*PITPNC1*	red
8875	*VNN2*	red
972	*CD74*	red
51705	*EMCN*	red
8503	*PIK3R3*	red

54453	*RIN2*	red
6035	*RNASE1*	red
79652	*TMEM204*	red
2995	*GYPC*	red
3384	*ICAM2*	red
3119	*HLA-DQB1*	red
834	*CASP1*	red
27122	*DKK3*	red
26251	*KCNG2*	red
11138	*TBC1D8*	red
109	*ADCY3*	red
8743	*TNFSF10*	red
3123	*HLA-DRB1*	red
3429	*IFI27*	red
7088	*TLE1*	red
4145	*MATK*	red
2013	*EMP2*	red
23643	*LY96*	red
6926	*TBX3*	red
10536	*P3H3*	red
23208	*SYT11*	red
8835	*SOCS2*	red
27303	*RBMS3*	red
2687	*GGT5*	red
221395	*ADGRF5*	red
129080	*EMID1*	red
28232	*SLCO3A1*	red
64061	*TSPYL2*	red
55843	*ARHGAP15*	red
947	*CD34*	red
3182	*HNRNPAB*	red
79812	*MMRN2*	red
2050	*EPHB4*	red
11007	*CCDC85B*	red
80310	*PDGFD*	red
581	*BAX*	red
3397	*ID1*	red
80723	*SLC35G2*	red
27065	*NSG1*	red
2040	*STOM*	red
25960	*ADGRA2*	red

1293	*COL6A3*	red
8446	*DUSP11*	red
6939	*TCF15*	red
80177	*MYCT1*	red
10875	*FGL2*	red
4052	*LTBP1*	red
2313	*FLI1*	red
5175	*PECAM1*	red
4242	*MFNG*	red
3554	*IL1R1*	red
10019	*SH2B3*	red
79172	*CENPO*	red
3128	*HLA-DRB6*	red
54922	*RASIP1*	red
80833	*APOL3*	red
25992	*SNED1*	red
55303	*GIMAP4*	red
8573	*CASK*	red
2014	*EMP3*	red
5915	*RARB*	red
64174	*DPEP2*	red
5613	*PRKX*	red
27190	*IL17B*	red
55691	*FRMD4A*	red
6300	*MAPK12*	red
1193	*CLIC2*	red
347544	*RPL18AP16*	red
10580	*SORBS1*	red
3488	*IGFBP5*	red
9771	*RAPGEF5*	red
5327	*PLAT*	red
1071	*CETP*	red
367	*AR*	red
2702	*GJA5*	red
9448	*MAP4K4*	red
3398	*ID2*	red
6236	*RRAD*	red
8543	*LMO4*	red
9590	*AKAP12*	red
51002	*TPRKB*	red
284403	*WDR62*	red

1393	*CRHBP*	red
22845	*DOLK*	red
6672	*SP100*	red
2828	*GPR4*	red
8805	*TRIM24*	red
55196	*KIAA1551*	red
26578	*OSTF1*	red
9767	*JADE3*	red
54538	*ROBO4*	red
3430	*IFI35*	red
54863	*TOR4A*	red
22918	*CD93*	red
474344	*GIMAP6*	red
874	*CBR3*	red
2114	*ETS2*	red
871	*SERPINH1*	red
30850	*CDR2L*	red
51192	*CKLF*	red
1305	*COL13A1*	red
1030	*CDKN2B*	red
51474	*LIMA1*	red
2324	*FLT4*	red
9899	*SV2B*	red
6403	*SELP*	red
9844	*ELMO1*	red
10231	*RCAN2*	red
51703	*ACSL5*	red
8536	*CAMK1*	red
9580	*SOX13*	red
23261	*CAMTA1*	red
64129	*TINAGL1*	red
4256	*MGP*	red
23597	*ACOT9*	red
26052	*DNM3*	red
104	*ADARB1*	red
23063	*WAPAL*	red
57198	*ATP8B2*	red
22900	*CARD8*	red
5287	*PIK3C2B*	red
79974	*CPED1*	red
9535	*GMFG*	red

8436	*SDPR*	red
5583	*PRKCH*	red
3937	*LCP2*	red
6197	*RPS6KA3*	red
8125	*ANP32A*	red
5967	*REG1A*	red
3459	*IFNGR1*	red
53826	*FXYD6*	red
27292	*DIMT1*	red
50807	*ASAP1*	red
5899	*RALB*	red
10365	*KLF2*	red
397	*ARHGDIB*	red
9537	*TP53I11*	red
9938	*ARHGAP25*	red
54910	*SEMA4C*	red
3714	*JAG2*	red
3215	*HOXB5*	red
56901	*NDUFA4L2*	red
1965	*EIF2S1*	red
2294	*FOXF1*	red
2887	*GRB10*	red
11322	*TMC6*	red
11177	*BAZ1A*	red
2824	*GPM6B*	red
29108	*PYCARD*	red
9976	*CLEC2B*	red
2157	*F8*	red
10567	*RABAC1*	red
64411	*ARAP3*	red
65108	*MARCKSL1*	red
4212	*MEIS2*	red
3725	*JUN*	red
5228	*PGF*	red
1009	*CDH11*	red
22861	*NLRP1*	red
9510	*ADAMTS1*	red
79630	*C1orf54*	red
79005	*SCNM1*	red
8829	*NRP1*	red
4893	*NRAS*	red

1535	*CYBA*	red
10161	*LPAR6*	red
51393	*TRPV2*	red
10384	*BTN3A3*	red
7126	*TNFAIP1*	red
4147	*MATN2*	red
2247	*FGF2*	red
57523	*NYNRIN*	red
2037	*EPB41L2*	red
9124	*PDLIM1*	red
55577	*NAGK*	red
4855	*NOTCH4*	red
958	*CD40*	red
3109	*HLA-DMB*	red
10954	*PDIA5*	red
4149	*MAX*	red
2523	*FUT1*	red
51465	*UBE2J1*	red
26112	*CCDC69*	red
6591	*SNAI2*	red
2876	*GPX1*	red
9337	*CNOT8*	red
7322	*UBE2D2*	red
92822	*ZNF276*	red
3481	*IGF2*	red
2113	*ETS1*	red
2117	*ETV3*	red
23076	*RRP1B*	red
7099	*TLR4*	red
442175	*RPLP2P1*	red
7075	*TIE1*	red
5836	*PYGL*	red
9710	*KIAA0355*	red
2621	*GAS6*	red
10212	*DDX39A*	red
10491	*CRTAP*	red
8563	*THOC5*	red
4851	*NOTCH1*	red
4065	*LY75*	red
7293	*TNFRSF4*	red
3113	*HLA-DPA1*	red

51499	*TRIAP1*	red
7089	*TLE2*	red
10203	*CALCRL*	red
22903	*BTBD3*	red
57048	*PLSCR3*	red
3628	*INPP1*	red
7102	*TSPAN7*	red
3108	*HLA-DMA*	red
8541	*PPFIA3*	red
10528	*NOP56*	red
5797	*PTPRM*	red
3383	*ICAM1*	red
51155	*HN1*	red
2791	*GNG11*	red
94	*ACVRL1*	red
6256	*RXRA*	red
3678	*ITGA5*	red
10634	*GAS2L1*	red
56936	*CCDC177*	red
9034	*CCRL2*	red
10280	*SIGMAR1*	red
5728	*PTEN*	red
6397	*SEC14L1*	red
3601	*IL15RA*	red
219654	*ZCCHC24*	red
2683	*B4GALT1*	red
6793	*STK10*	red
1396	*CRIP1*	red
135	*ADORA2A*	red
26277	*TINF2*	red
3566	*IL4R*	red
23462	*HEY1*	red
11259	*FILIP1L*	red
2624	*GATA2*	red
7090	*TLE3*	red
57228	*SMAGP*	red
51278	*IER5*	red
2615	*LRRC32*	red
10266	*RAMP2*	red
4208	*MEF2C*	red
3399	*ID3*	red

974	*CD79B*	red
4651	*MYO10*	red
7123	*CLEC3B*	red
23333	*DPY19L1*	red
9630	*GNA14*	red
55885	*LMO3*	red
5156	*PDGFRA*	red
4056	*LTC4S*	red
4071	*TM4SF1*	red
51763	*INPP5K*	red
55790	*CSGALNACT1*	red
4170	*MCL1*	red
9754	*STARD8*	red
493	*ATP2B4*	red
6525	*SMTN*	red
9555	*H2AFY*	red
634	*CEACAM1*	red
7433	*VIPR1*	red
2078	*ERG*	red
4301	*MLLT4*	red
79677	*SMC6*	red
4363	*ABCC1*	red
9760	*TOX*	red
9886	*RHOBTB1*	red
55813	*UTP6*	red
51100	*SH3GLB1*	red
10003	*NAALAD2*	red
7329	*UBE2I*	red
10410	*IFITM3*	red
6886	*TAL1*	red
5912	*RAP2B*	red
6405	*SEMA3F*	red
391132	*LOC391132*	red
5799	*PTPRN2*	red
404672	*GTF2H5*	red
953	*ENTPD1*	red
6624	*FSCN1*	red
4846	*NOS3*	red
58494	*JAM2*	red
51118	*UTP11L*	red
5896	*RAG1*	red

8642	*DCHS1*	red
57608	*KIAA1462*	red
81577	*GFOD2*	red
7637	*ZNF84*	red
29095	*ORMDL2*	red
9781	*RNF144A*	red
9638	*FEZ1*	red
83442	*SH3BGRL3*	red
3992	*FADS1*	red
4330	*MN1*	red
8890	*EIF2B4*	red
3726	*JUNB*	red
57513	*CASKIN2*	red
4258	*MGST2*	red
7453	*WARS*	red
63895	*PIEZO2*	red
60673	*ATG101*	red
9647	*PPM1F*	red
8487	*GEMIN2*	red
6890	*TAP1*	red
55795	*PCID2*	red
9079	*LDB2*	red
55107	*ANO1*	red
7048	*TGFBR2*	red
3270	*HRC*	red
22899	*ARHGEF15*	red
3382	*ICA1*	red
965	*CD58*	red
753	*LDLRAD4*	red
8496	*PPFIBP1*	red
442171	*RPL10P2*	red
9644	*SH3PXD2A*	red
640	*BLK*	red
28960	*DCPS*	red
2091	*FBL*	red
57157	*PHTF2*	red
10436	*EMG1*	red
8742	*TNFSF12*	red
23179	*RGL1*	red
3487	*IGFBP4*	red
23231	*SEL1L3*	red

51063	*CALHM2*	red
51177	*PLEKHO1*	red
7706	*TRIM25*	red
55619	*DOCK10*	red
81619	*TSPAN14*	red
2487	*FRZB*	red
56911	*MAP3K7CL*	red
2	*A2M*	red
6940	*ZNF354A*	red
3579	*CXCR2*	red
57124	*CD248*	red
51226	*COPZ2*	red
2022	*ENG*	red
55269	*PSPC1*	red
256949	*KANK3*	red
6004	*RGS16*	red
5699	*PSMB10*	red
55106	*SLFN12*	red
23526	*HMHA1*	red
5998	*RGS3*	red
1909	*EDNRA*	red
51634	*RBMX2*	red
1036	*CDO1*	red
3087	*HHEX*	red
976	*ADGRE5*	red
57576	*KIF17*	red
6915	*TBXA2R*	red
9530	*BAG4*	red
3707	*ITPKB*	red
1054	*CEBPG*	red
80301	*PLEKHO2*	red
1432	*MAPK14*	red
6238	*RRBP1*	red
11119	*BTN3A1*	red
30845	*EHD3*	red
57572	*DOCK6*	red
5787	*PTPRB*	red
5269	*SERPINB6*	red
1282	*COL4A1*	red
5550	*PREP*	red
64943	*NT5DC2*	red

5698	*PSMB9*	red
51285	*RASL12*	red
7035	*TFPI*	red
3133	*HLA-E*	red
7056	*THBD*	red
51294	*PCDH12*	red
2395	*FXN*	red
1003	*CDH5*	red
55785	*FGD6*	red
1235	*CCR6*	red
10109	*ARPC2*	red
22998	*LIMCH1*	red
55038	*CDCA4*	red
4854	*NOTCH3*	red
6480	*ST6GAL1*	red
7168	*TPM1*	red
51267	*CLEC1A*	red
6494	*SIPA1*	red
81848	*SPRY4*	red
6158	*RPL28*	red
9168	*TMSB10*	red
4092	*SMAD7*	red
107	*ADCY1*	red
4487	*MSX1*	red
55707	*NECAP2*	red
3791	*KDR*	red
3977	*LIFR*	red
706	*TSPO*	red
10631	*POSTN*	red
23683	*PRKD3*	red
54621	*VSIG10*	red
1513	*CTSK*	red
54345	*SOX18*	red
5982	*RFC2*	red
9459	*ARHGEF6*	red
187	*APLNR*	red
3551	*IKBKB*	red
912	*CD1D*	red
25966	*C2CD2*	red
1050	*CEBPA*	red
1175	*AP2S1*	red

5770	*PTPN1*	red
8260	*NAA10*	red
4690	*NCK1*	red
1466	*CSRP2*	red
7291	*TWIST1*	red
10228	*STX6*	red
64785	*GINS3*	red
57817	*HAMP*	red
56654	*NPDC1*	red
9843	*HEPH*	red
30851	*TAX1BP3*	red
9880	*ZBTB39*	red
83468	*GLT8D2*	red
10241	*CALCOCO2*	red
54707	*GPN2*	red
93349	*SP140L*	red
3632	*INPP5A*	red
1476	*CSTB*	red
11118	*BTN3A2*	red
7203	*CCT3*	red
5928	*RBBP4*	red
4734	*NEDD4*	red
3750	*KCND1*	red
10121	*ACTR1A*	red
6883	*TAF12*	red
1284	*COL4A2*	red
54809	*SAMD9*	red
389	*RHOC*	red
9592	*IER2*	red
3142	*HLX*	red
55119	*PRPF38B*	red
746	*TMEM258*	red
54861	*SNRK*	red
3659	*IRF1*	red
5138	*PDE2A*	red
55740	*ENAH*	red
5305	*PIP4K2A*	red
8905	*AP1S2*	red
1012	*CDH13*	red
5216	*PFN1*	red
1847	*DUSP5*	red

10656	*KHDRBS3*	red
3956	*LGALS1*	red
80025	*PANK2*	red
5082	*PDCL*	red
23266	*ADGRL2*	red
55003	*PAK1IP1*	red
9462	*RASAL2*	red
837	*CASP4*	red
51373	*MRPS17*	red
10252	*SPRY1*	red
64091	*POPDC2*	red
1942	*EFNA1*	red
7318	*UBA7*	red
5696	*PSMB8*	red
56603	*CYP26B1*	red
2200	*FBN1*	red
4521	*NUDT1*	red
79720	*VPS37B*	red
56000	*NXF3*	red
5947	*RBP1*	red
8459	*TPST2*	red
7846	*TUBA1A*	red
51162	*EGFL7*	red
1306	*COL15A1*	red
4296	*MAP3K11*	red
6275	*S100A4*	red
51690	*LSM7*	red
116496	*FAM129A*	red
8612	*PPAP2C*	red
8764	*TNFRSF14*	red
65998	*C11orf95*	red
10985	*GCN1L1*	red
10403	*NDC80*	red
5321	*PLA2G4A*	red
9457	*FHL5*	red
3908	*LAMA2*	red
23545	*ATP6V0A2*	red
2625	*GATA3*	red
55281	*TMEM140*	red
10769	*PLK2*	red
2826	*CCR10*	red

2669	*GEM*	red
8925	*HERC1*	red
64321	*SOX17*	red
283298	*OLFML1*	red
11000	*SLC27A3*	red
22913	*RALY*	red
23336	*SYNM*	red
51550	*CINP*	red
10234	*LRRC17*	red
81578	*COL21A1*	red
8406	*SRPX*	red
2620	*GAS2*	red
8525	*DGKZ*	red
5376	*PMP22*	red
3117	*HLA-DQA1*	red
5414	*SEPTIN4*	red
1277	*COL1A1*	salmon
9332	*CD163*	salmon
1591	*CYP24A1*	salmon
7058	*THBS2*	salmon
4837	*NNMT*	salmon
7462	*LAT2*	salmon
55165	*CEP55*	salmon
2219	*FCN1*	salmon
719	*C3AR1*	salmon
11326	*VSIG4*	salmon
2268	*FGR*	salmon
6351	*CCL4*	salmon
6039	*RNASE6*	salmon
712	*C1QA*	salmon
4069	*LYZ*	salmon
11151	*CORO1A*	salmon
3553	*IL1B*	salmon
91543	*RSAD2*	salmon
7305	*TYROBP*	salmon
9582	*APOBEC3B*	salmon
6347	*CCL2*	salmon
9636	*ISG15*	salmon
79019	*CENPM*	salmon
64581	*CLEC7A*	salmon
2537	*IFI6*	salmon

10437	*IFI30*	salmon
2123	*EVI2A*	salmon
64231	*MS4A6A*	salmon
2207	*FCER1G*	salmon
3872	*KRT17*	salmon
2215	*FCGR3B*	salmon
728	*C5AR1*	salmon
3689	*ITGB2*	salmon
5341	*PLEK*	salmon
9450	*LY86*	salmon
1278	*COL1A2*	salmon
83716	*CRISPLD2*	salmon
9235	*IL32*	salmon
1475	*CSTA*	salmon
53829	*P2RY13*	salmon
7409	*VAV1*	salmon
10874	*NMU*	salmon
56253	*CRTAM*	salmon
963	*CD53*	salmon
4599	*MX1*	salmon
695	*BTK*	salmon
9055	*PRC1*	salmon
5199	*CFP*	salmon
4064	*CD180*	salmon
64127	*NOD2*	salmon
717	*C2*	salmon
51316	*PLAC8*	salmon
1959	*EGR2*	salmon
597	*BCL2A1*	salmon
24137	*KIF4A*	salmon
1675	*CFD*	salmon
1536	*CYBB*	salmon
962	*CD48*	salmon
9595	*CYTIP*	salmon
55247	*NEIL3*	salmon
57214	*CEMIP*	salmon
3669	*ISG20*	salmon
10993	*SDS*	salmon
2357	*FPR1*	salmon
7096	*TLR1*	salmon
10346	*TRIM22*	salmon

241	*ALOX5AP*	salmon
6614	*SIGLEC1*	salmon
409	*ARRB2*	salmon
51311	*TLR8*	salmon
9051	*PSTPIP1*	salmon
4688	*NCF2*	salmon
4938	*OAS1*	salmon
5831	*PYCR1*	salmon
50856	*CLEC4A*	salmon
2335	*FN1*	salmon
752	*FMNL1*	salmon
79968	*WDR76*	salmon
4600	*MX2*	salmon
3903	*LAIR1*	salmon
54739	*XAF1*	salmon
7538	*ZFP36*	salmon
6283	*S100A12*	salmon
28231	*SLCO4A1*	salmon
1520	*CTSS*	salmon
2921	*CXCL3*	salmon
4689	*NCF4*	salmon
2205	*FCER1A*	salmon
2650	*GCNT1*	salmon
1164	*CKS2*	salmon
7133	*TNFRSF1B*	salmon
4050	*LTB*	salmon
6688	*SPI1*	salmon
55911	*APOBR*	salmon
284021	*MILR1*	salmon
6402	*SELL*	salmon
3702	*ITK*	salmon
51284	*TLR7*	salmon
5359	*PLSCR1*	salmon
6648	*SOD2*	salmon
5788	*PTPRC*	salmon
51411	*BIN2*	salmon
10288	*LILRB2*	salmon
79444	*BIRC7*	salmon
11010	*GLIPR1*	salmon
3936	*LCP1*	salmon
6280	*S100A9*	salmon

57823	*SLAMF7*	salmon
11314	*CD300A*	salmon
7940	*LST1*	salmon
10333	*TLR6*	salmon
969	*CD69*	salmon
6404	*SELPLG*	salmon
9770	*RASSF2*	salmon
4046	*LSP1*	salmon
4542	*MYO1F*	salmon
3665	*IRF7*	salmon
64108	*RTP4*	salmon
3732	*CD82*	salmon
3684	*ITGAM*	salmon
4038	*LRP4*	salmon
4332	*MNDA*	salmon
2124	*EVI2B*	salmon
3587	*IL10RA*	salmon
27128	*CYTH4*	salmon
5978	*REST*	salmon
3687	*ITGAX*	salmon
390411	*NPM1P22*	salmon
3055	*HCK*	salmon
5366	*PMAIP1*	salmon
2533	*FYB*	salmon
915	*CD3D*	salmon
64135	*IFIH1*	salmon
3394	*IRF8*	salmon
10561	*IFI44*	salmon
970	*CD70*	salmon
51611	*DPH5*	salmon
6286	*S100P*	salmon
9046	*DOK2*	salmon
11245	*GPR176*	salmon
8519	*IFITM1*	salmon
55379	*LRRC59*	salmon
2863	*GPR39*	salmon
3965	*LGALS9*	salmon
11262	*SP140*	salmon
945	*CD33*	salmon
5265	*SERPINA1*	salmon
3560	*IL2RB*	salmon

5794	*PTPRH*	salmon
1441	*CSF3R*	salmon
7454	*WAS*	salmon
10475	*TRIM38*	salmon
28954	*REM1*	salmon
3159	*HMGA1*	salmon
6398	*SECTM1*	salmon
3676	*ITGA4*	salmon
55008	*HERC6*	salmon
23092	*ARHGAP26*	salmon
9242	*MSC*	salmon
9900	*SV2A*	salmon
5610	*EIF2AK2*	salmon
11219	*TREX2*	salmon
28639	*TRBC1*	salmon
1436	*CSF1R*	salmon
7351	*UCP2*	salmon
4940	*OAS3*	salmon
5097	*PCDH1*	salmon
899	*CCNF*	salmon
23219	*FBXO28*	salmon
25830	*SULT4A1*	salmon
10261	*IGSF6*	salmon
7456	*WIPF1*	salmon
2253	*FGF8*	salmon
586	*BCAT1*	salmon
3431	*SP110*	salmon
3437	*IFIT3*	salmon
4074	*M6PR*	salmon
861	*RUNX1*	salmon
7086	*TKT*	salmon
11027	*LILRA2*	salmon
1871	*E2F3*	salmon
8819	*SAP30*	salmon
9111	*NMI*	salmon
8698	*S1PR4*	salmon
27087	*B3GAT1*	salmon
57089	*ENTPD7*	salmon
54815	*GATAD2A*	salmon
9517	*SPTLC2*	salmon
3779	*KCNMB1*	salmon

56905	*C15orf39*	salmon
10211	*FLOT1*	salmon
79865	*TREML2*	salmon
7179	*TPTE*	salmon
27023	*FOXB1*	salmon
4067	*LYN*	salmon
8477	*GPR65*	salmon
79845	*RNF122*	salmon
6891	*TAP2*	salmon
6556	*SLC11A1*	salmon
54974	*THG1L*	salmon
81030	*ZBP1*	salmon
9473	*THEMIS2*	salmon
3068	*HDGF*	salmon
116372	*LYPD1*	salmon
1524	*CX3CR1*	salmon
389856	*USP27X*	salmon
6662	*SOX9*	salmon
5471	*PPAT*	salmon
64919	*BCL11B*	salmon
729230	*CCR2*	salmon
6274	*S100A3*	salmon
9957	*HS3ST1*	salmon
7124	*TNF*	salmon
24138	*IFIT5*	salmon
54149	*C21orf91*	salmon
10570	*DPYSL4*	salmon
8654	*PDE5A*	salmon
3071	*NCKAP1L*	salmon
4068	*SH2D1A*	salmon
5949	*RBP3*	salmon
57128	*LYRM4*	salmon
79723	*SUV39H2*	salmon
960	*CD44*	salmon
23368	*PPP1R13B*	salmon
6737	*TRIM21*	salmon
1043	*CD52*	salmon
4939	*OAS2*	salmon
6455	*SH3GL1*	salmon
1521	*CTSW*	salmon
7703	*PCGF2*	salmon

79149	*ZSCAN5A*	salmon
1058	*CENPA*	salmon
4153	*MBL2*	salmon
80380	*PDCD1LG2*	salmon
3037	*HAS2*	salmon
6199	*RPS6KB2*	salmon
2915	*GRM5*	salmon
8530	*CST7*	salmon
951	*CD37*	salmon
51806	*CALML5*	salmon
9447	*AIM2*	salmon
2848	*GPR25*	salmon
6732	*SRPK1*	salmon
221692	*PHACTR1*	salmon
10379	*IRF9*	salmon
921	*CD5*	salmon
22821	*RASA3*	salmon
8828	*NRP2*	salmon
672	*BRCA1*	salmon
9050	*PSTPIP2*	salmon
3340	*NDST1*	salmon
5880	*RAC2*	salmon
51154	*MRTO4*	salmon
7517	*XRCC3*	salmon
3002	*GZMB*	salmon
3939	*LDHA*	salmon
29992	*PILRA*	salmon
90861	*HN1L*	salmon
3932	*LCK*	salmon
10849	*CD3EAP*	salmon
27040	*LAT*	salmon
2920	*CXCL2*	salmon
998	*CDC42*	salmon
3683	*ITGAL*	salmon
27071	*DAPP1*	salmon
140801	*RPL10L*	salmon
54440	*SASH3*	salmon
3980	*LIG3*	salmon
3635	*INPP5D*	salmon
5292	*PIM1*	salmon
5721	*PSME2*	salmon

8048	*CSRP3*	salmon
26099	*SZRD1*	salmon
254102	*EHBP1L1*	salmon
5999	*RGS4*	salmon
433	*ASGR2*	salmon
56993	*TOMM22*	salmon
713	*C1QB*	salmon
5317	*PKP1*	salmon
6515	*SLC2A3*	salmon
653639	*LYPLA2P1*	salmon
7980	*TFPI2*	salmon
1794	*DOCK2*	salmon
6357	*CCL13*	salmon
9143	*SYNGR3*	salmon
5087	*PBX1*	salmon
10347	*ABCA7*	salmon
10578	*GNLY*	salmon
22914	*KLRK1*	salmon
4920	*ROR2*	salmon
8361	*HIST1H4F*	salmon
7851	*MALL*	salmon
5579	*PRKCB*	salmon
5581	*PRKCE*	salmon
9493	*KIF23*	salmon
5433	*POLR2D*	salmon
3561	*IL2RG*	salmon
8540	*AGPS*	salmon
8407	*TAGLN2*	salmon
10721	*POLQ*	salmon
7402	*UTRN*	salmon
10544	*PROCR*	salmon
925	*CD8A*	salmon
51657	*STYXL1*	salmon
2526	*FUT4*	salmon
4001	*LMNB1*	salmon
28526	*TRDC*	salmon
4017	*LOXL2*	salmon
4224	*MEP1A*	salmon
51338	*MS4A4A*	salmon
9734	*HDAC9*	salmon
1437	*CSF2*	salmon

54976	*C20orf27*	salmon
8869	*ST3GAL5*	salmon
10326	*SIRPB1*	salmon
3433	*IFIT2*	salmon
919	*CD247*	salmon
8348	*HIST1H2BO*	salmon
81285	*OR51E2*	salmon
79180	*EFHD2*	salmon
30817	*ADGRE2*	salmon
1848	*DUSP6*	salmon
23133	*PHF8*	salmon
51571	*FAM49B*	salmon
9334	*B4GALT5*	salmon
220134	*SKA1*	salmon
6664	*SOX11*	salmon
5551	*PRF1*	salmon
64806	*IL25*	salmon
2119	*ETV5*	salmon
4818	*NKG7*	salmon
7128	*TNFAIP3*	salmon
7157	*TP53*	salmon
284119	*PTRF*	salmon
9410	*SNRNP40*	salmon
51365	*PLA1A*	salmon
3594	*IL12RB1*	salmon
10123	*ARL4C*	salmon
5892	*RAD51D*	salmon
864	*RUNX3*	salmon
4317	*MMP8*	salmon
3489	*IGFBP6*	salmon
6279	*S100A8*	salmon
51348	*KLRF1*	salmon
5970	*RELA*	salmon
2026	*ENO2*	salmon
5266	*PI3*	salmon
2161	*F12*	salmon
2999	*GZMH*	salmon
5179	*PENK*	salmon
55140	*ELP3*	salmon
5920	*RARRES3*	salmon
56935	*SMCO4*	salmon

2841	*GPR18*	salmon
3371	*TNC*	salmon
3043	*HBB*	salmon
64795	*RMND5A*	salmon
3012	*HIST1H2AE*	salmon
440738	*MAP1LC3C*	salmon
87	*ACTN1*	salmon
80830	*APOL6*	salmon
968	*CD68*	salmon
3040	*HBA2*	salmon
3001	*GZMA*	salmon
154	*ADRB2*	salmon
4162	*MCAM*	salmon
6352	*CCL5*	salmon
115123	*MARCHF3*	salmon

Supplemental Table S6: List of 194 significantly associated pathways (p<0.05) from genes in the three HF modules

Ingenuity Canonical Pathways	-log(B-H p-value)	Molecules
Hepatic Fibrosis / Hepatic Stellate Cell Activation	1.11E+01	A2M,ACTA2,AGTR1,BAX,CCL2,CCL5,CD14,CD40,COL11A2,COL13A1,COL15A1,COL1A1,COL1A2,COL21A1,COL4A1,COL4A2,COL5A2,COL6A3,CXCL3,EDNRA,FAS,FGF2,FLT4,FN1,ICAM1,IFNAR2,IFNGR1,IFNGR2,IGF2,IGFBP4,IGFBP5,IL10RA,IL1B,IL1R1,IL1RL1,IL4R,KDR,LY96,MMP2,MYH11,PDGFB,PDGFD,PDGFRA,PGF,RELA,SMAD7,TGFB1,TGFB2,TGFBR2,TLR4,TNF,TNFRSF1B
Th1 and Th2 Activation Pathway	1.05E+01	CD247,CD3D,CD4,CD40,CD8A,CXCR4,GATA3,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,ICAM1,IFNGR1,IFNGR2,IL10RA,IL12A,IL12RB1,IL1RL1,IL25,IL27RA,IL2RB,IL2RG,IL4R,IRF1,ITGB2,JAG2,JUN,LGALS9,NFATC4,NOTCH1,NOTCH3,NOTCH4,PIK3C2B,PIK3R3,RUNX3,S1PR1,SPI1,TGFB1,TGFBR2,TNFRSF4,VAV1
Role of Pattern Recognition Receptors in Recognition of Bacteria and Viruses	9.79E+00	C1QA,C1QB,C3AR1,C5AR1,CASP1,CCL5,CD70,CLEC7A,CSF2,EIF2AK2,EIF2S1,IFIH1,IL12A,IL17B,IL1B,IL25,IRF7,LTB,MAPK12,MBL2,MYD88,NOD2,OAS1,OAS2,OAS3,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RELA,TGFB1,TGFB2,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TNFSF10,TNFSF12
Th2 Pathway	8.89E+00	CD247,CD3D,CD4,CD40,CXCR4,GATA3,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,ICAM1,IL12A,IL12RB1,IL1RL1,IL25,IL2RB,IL2RG,IL4R,ITGB2,JAG2,JUN,NOTCH1,NOTCH3,NOTCH4,PIK3C2B,PIK3R3,RUNX3,S1PR1,SPI1,TGFB1,TGFBR2,TNFRSF4,VAV1
Systemic Lupus Erythematosus In B Cell Signaling Pathway	8.49E+00	BTK,CALML5,CCND1,CD40,CD5,CD70,CD79B,CSF2,CSK,FGR,HCK,IFIH1,IFIT2,IFIT3,IFNAR2,IFNGR1,IFNGR2,IL12A,IL17B,IL1B,IL25,INPP5D,INPP5K,IRF7,IRF9,ISG15,ISG20,JUN,LCK,LTB,LYN,MAP3K14,MAP4K4,MCL1,MRAS,MYC,MYD88,NFATC4,NRAS,PIK3C2B,PIK3R3,PLAAT4,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RELA,TGFB1,TGFB2,TLR7,TLR8,TNF,TNFSF10,TNFSF12,VAV1

Th1 Pathway	8.16E+00	CD247,CD3D,CD4,CD40,CD8A,GATA3,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,ICAM1,IFNGR1,IFNGR2,IL10RA,IL12A,IL12RB1,IL27RA,IRF1,ITGB2,LGALS9,NFATC4,NOTCH1,NOTCH3,NOTCH4,PIK3C2B,PIK3R3,RUNX3,VAV1
Type I Diabetes Mellitus Signaling	8.09E+00	CASP8,CD247,CD3D,FAS,FCER1G,GZMB,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,ICA1,IFNGR1,IFNGR2,IKBKB,IL12A,IL1B,IL1R1,IRF1,MAP3K14,MAPK11,MAPK12,MAPK14,MYD88,NFKBIE,PRF1,RELA,SOCS2,TNF,TNFRSF1B
iCOS-iCOSL Signaling in T Helper Cells	7.45E+00	CALML5,CD247,CD3D,CD4,CD40,CSK,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IKBKB,IL2RB,IL2RG,INPP5D,ITK,ITPR3,LAT,LCK,LCP2,NFATC4,NFKBIE,PIK3C2B,PIK3R3,PTEN,PTPRC,RELA,VAV1
Interferon Signaling	7.33E+00	BAK1,BAX,IFI35,IFI6,IFIT3,IFITM1,IFITM3,IFNAR2,IFNGR1,IFNGR2,IRF1,IRF9,ISG15,MX1,OAS1,PSMB8,RELA,TAP1
CD28 Signaling in T Helper Cells	6.98E+00	ARPC1B,ARPC2,CALML5,CD247,CD3D,CD4,CDC42,CSK,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IKBKB,ITK,ITPR3,JUN,LAT,LCK,LCP2,MAPK12,NFATC4,NFKBIE,PIK3C2B,PIK3R3,PTPRC,RELA,VAV1,WAS
Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis	6.80E+00	C5AR1,CALML5,CCL2,CCL5,CCND1,CEBPA,CEBPB,CEBPG,CSF2,DKK1,DKK3,FCGR3A/FCGR3B,FGF2,FN1,FRZB,FZD4,ICAM1,IKBKB,IL16,IL1B,IL1R1,IL1RL1,IL32,IL7,JUN,LTB,MAP3K14,MAPK14,MMP3,MRAS,MYC,MYD88,NFATC4,NFKBIE,NRAS,PDGFB,PDGFD,PGF,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,ROR2,TCF3,TGFB1,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TNFRSF1B,WNT5B
Dendritic Cell Maturation	6.33E+00	CD1D,CD40,CD58,COL11A2,COL1A1,COL1A2,CSF2,FCER1G,FCGR3A/FCGR3B,FSCN1,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,ICAM1,IKBKB,IL12A,IL1B,IL32,IRF8,LTB,LY75,MAP3K14,MAPK11,MAPK12,MAPK14,MYD88,NFKBIE,PIK3C2B,PIK3R3,RELA,TLR4,TNF,TNFRSF1B,TYROBP

OX40 Signaling Pathway	6.24E+00	CD247,CD3D,CD4,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,JUN,MAPK12,NFKBIE,RELA,TNFRSF4
Tec Kinase Signaling	6.24E+00	ACTA2,ACTC1,BLK,BTK,CDC42,FAS,FCER1A,FCER1G,FGR,GNA14,GNG11,GNG7,HCK,ITGA4,ITGA5,ITK,LCK,LYN,MAPK12,MRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RELA,RHOBTB1,RHOC,RND3,TLR4,TNF,TNFRSF10B,TNFSF10,TNFSF12,VAV1,WAS
PD-1, PD-L1 cancer immunotherapy pathway	6.24E+00	CD247,CSK,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,IFNGR1,IFNGR2,IL12A,IL2RB,IL2RG,LAT,LCK,LCP2,PDCD1LG2,PIK3C2B,PIK3R3,PTEN,TGFB1,TGFB2,TNF,TNFRSF1B
Neuroinflammation Signaling Pathway	6.06E+00	BIRC5,BIRC7,CASP1,CASP8,CCL2,CCL5,CD40,CSF1R,CX3CL1,CX3CR1,CYBB,FAS,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,ICAM1,IFNGR1,IFNGR2,IKBKB,IL12A,IL1B,IL1R1,IRF7,JUN,MAPK11,MAPK12,MAPK14,MFGE8,MMP3,MYD88,NCF2,NFATC4,PIK3C2B,PIK3R3,PLA2G4A,PLA2G4C,PYCARD,RELA,SLC1A3,SOD2,TGFB1,TGFB2,TGFBR2,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TYROBP
T Helper Cell Differentiation	6.05E+00	BCL6,CD40,FCER1G,GATA3,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IFNGR1,IFNGR2,IL10RA,IL12A,IL12RB1,IL2RG,IL4R,TGFB1,TGFBR2,TNF,TNFRSF1B
Altered T Cell and B Cell Signaling in Rheumatoid Arthritis	6.05E+00	CD40,CD79B,CSF2,FAS,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IL12A,IL1B,LTB,MAP3K14,RELA,TGFB1,TLR1,TLR4,TLR6,TLR7,TLR8,TNF
TREM1 Signaling	5.94E+00	CASP1,CCL2,CD40,CSF2,CXCL3,ICAM1,IL1B,IL1RL1,ITGA5,ITGAX,LAT2,MYD88,NOD2,RELA,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TYROBP
Phagosome Formation	5.89E+00	C3AR1,C5AR1,CDC42,CLEC7A,FCER1A,FCER1G,FCGR3A/FCGR3B,FN1,ITGA4,ITGA5,ITGAM,ITGAX,ITGB2,MBL2,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RHOBTB1,RHOC,RND3,TLR1,TLR4,TLR6,TLR7,TLR8

Leukocyte Extravasation Signaling	5.87E+00	ACTA2,ACTC1,ACTN1,AFDN,ARHGAP4,BTK,CD44,CDC42,CDH5,CXCR4,CYBA,CYBB,ICAM1,ITGA4,ITGA5,ITGAL,ITGAM,ITGB2,ITK,JAM2,MAPK11,MAPK12,MAPK14,MMP2,MMP3,MMP8,NCF2,NCF4,PECAM1,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,SELPLG,SIPA1,VASP,VAV1,WAS,WIPF1
HMGB1 Signaling	5.87E+00	CCL2,CD70,CDC42,CSF2,ICAM1,IFNGR1,IFNGR2,IL12A,IL17B,IL1B,IL1R1,IL25,JUN,LTB,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PLAT,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3,TGFB1,TGFB2,TLR4,TNF,TNFRSF1B,TNFSF10,TNFSF12
Role of NFAT in Regulation of the Immune Response	5.63E+00	BTK,CALML5,CD247,CD3D,CD4,CD79B,FCER1A,FCER1G,FCGR3A/FCGR3B,GNA14,GNG11,GNG7,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IKBKB,ITK,ITPR3,JUN,LAT,LCK,LCP2,LYN,MEF2C,MRAS,NFATC4,NFKBIE,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RCAN2,RELA
Antigen Presentation Pathway	5.63E+00	CD74,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,PSMB8,PSMB9,TAP1,TAP2
Calcium-induced T Lymphocyte Apoptosis	5.52E+00	ATP2A3,CALML5,CD247,CD3D,CD4,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,ITPR3,LCK,PRKCB,PRKCE,PRKCH,PRKD3
Allograft Rejection Signaling	5.52E+00	CD40,FAS,FCER1G,GZMB,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,PRF1,TNF
Toll-like Receptor Signaling	5.52E+00	CD14,EIF2AK2,IKBKB,IL12A,IL1B,IL1RL1,JUN,LY96,MAP3K14,MAP4K4,MAPK11,MAPK12,MAPK14,MYD88,RELA,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TNFAIP3
Crosstalk between Dendritic Cells and Natural Killer Cells	5.45E+00	ACTA2,ACTC1,CD40,CD69,CSF2,FAS,FSCN1,HLA-DRA,HLA-DRB1,HLA-E,IL12A,IL15RA,IL2RB,IL2RG,ITGAL,KLRC4-KLRK1/KLRK1,LTB,PRF1,RELA,TLR4,TLR7,TNF,TNFRSF1B,TNFSF10,TYROBP
Cdc42 Signaling	5.35E+00	ARHGEF6,ARPC1B,ARPC2,CD247,CD3D,CDC42,CDC42SE1,FCER1G,FGD1,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,ITGA4,ITGA5,ITK,JUN,MAP3K11,MAPK11,MAPK12,MAPK14,VAV1,WAS,WIPF1

Phospholipase C Signaling	4.97E+00	ADCY1,ADCY3,ARHGEF15,ARHGEF2,ARHGEF6,ARHGEF7,BTK,CALML5,CD247,CD3D,CD79B,CDC42,FCER1G,GNG11,GNG7,HDAC7,HDAC9,ITGA4,ITGA5,ITK,ITPR3,LAT,LCK,LCP2,LYN,MEF2C,MRAS,NFATC4,NRAS,PLA2G4A,PLA2G4C,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3,RPS6KA3,TGM2
Fcε Receptor-mediated Phagocytosis in Macrophages and Monocytes	4.96E+00	ACTA2,ACTC1,ARPC1B,ARPC2,CDC42,CSF2,FCGR3A/FCGR3B,FGR,FYB1,HCK,INPP5D,LCP2,LYN,NCK1,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,PTEN,RAC2,RPS6KB2,VASP,VAV1,WAS
iNOS Signaling	4.90E+00	CALML5,CD14,HMGA1,IFNGR1,IFNGR2,IKBKB,IRF1,JUN,LY96,MAPK11,MAPK12,MAPK14,MYD88,NFKBIE,RELA,TLR4
IL-8 Signaling	4.80E+00	ARRB2,BAX,CCND1,CDC42,CSTB,CXCR2,CYBB,FLT4,GNG11,GNG7,ICAM1,IKBKB,ITGAM,ITGAX,ITGB2,JUN,KDR,MAP4K4,MAPK12,MMP2,MRAS,NCF2,NRAS,PGF,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3,TEK,VASP
Granulocyte Adhesion and Diapedesis	4.80E+00	C5AR1,CCL13,CCL18,CCL2,CCL4,CCL5,CDH5,CKLF,CSF3R,CX3CL1,CXCL2,CXCL3,CXCR2,CXCR4,FPR1,ICAM1,ICAM2,IL1B,IL1R1,IL1RL1,ITGA4,ITGA5,ITGAL,ITGAM,ITGB2,MMP2,MMP3,MMP8,PECAM1,SELL,SELP,SELPLG,TNF,TNFRSF1B
B Cell Receptor Signaling	4.80E+00	BCL2A1,BCL6,BTK,CALML5,CD79B,CDC42,CSK,DAPP1,ETS1,IKBKB,INPP5D,INPP5K,JUN,LYN,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,MEF2C,MRAS,NFATC4,NFKBIE,NRAS,PIK3C2B,PIK3R3,PRKCB,PTEN,PTPRC,RAC2,RALB,RAP2B,RELA,RPS6KB2,TCF3,VAV1
T Cell Exhaustion Signaling Pathway	4.80E+00	BCL6,FCER1G,GZMB,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,IFNAR2,IL10RA,IL12A,IL12RB1,IRF9,JUN,KDR,LGALS9,MAPK12,MRAS,NFATC4,NRAS,PDCD1LG2,PIK3C2B,PIK3R3,PRDM1,RALB,RAP2B,TGFB1,TGFBR2,TNFRSF14
Hepatic Cholestasis	4.68E+00	ABCC1,ADCY1,ADCY3,CD14,CD70,CETP,CSF2,IKBKB,IL12A,IL17B,IL1B,IL1R1,IL1RL1,IL25,JUN,LTB,LY96,MAP3K14,MAPK12,MYD88,NFKBIE,NR5A2,PRKCB,PRKCE,PRKCH,PRKD3,RELA,RXRA,SLCO3A1,TGFB1,TGFB2,TLR4,TNF,TNFRSF1B,TNFSF10,TNFSF12

STAT3 Pathway	4.63E+00	CXCR2,FGF2,FLT4,IL10RA,IL12RB1,IL15RA,IL1B,IL1R1,IL1RL1,IL27RA,IL2RB,IL2RG,IL4R,KDR,MAP3K11,MAPK11,MAPK12,MAPK14,MRAS,MYC,NRAS,PDGFB,PDGFRA,PIM1,RALB,RAP2B,SOCS2,TGFB1,TGFB2,TGFBR2
Cardiac Hypertrophy Signaling (Enhanced)	4.62E+00	ADCY1,ADCY3,ADRB2,AGTR1,ATP2A3,CACNA1C,CALML5,CD70,CSF2,CXCR2,CYBB,EDNRA,EIF2B4,FGF2,FGF8,FZD4,GNA14,GNG11,GNG7,HDAC7,HDAC9,HSPB3,IKBKB,IL10RA,IL12A,IL12RB1,IL15RA,IL17B,IL1B,IL1R1,IL1RL1,IL25,IL27RA,IL2RB,IL2RG,IL4R,ITGA4,ITGA5,ITPR3,JUN,LTB,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,MEF2C,MRAS,MYC,NFATC4,NRAS,PDE2A,PDE5A,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,PTEN,RALB,RAP2B,RELA,RPS6KB2,TGFB1,TGFB2,TGFBR2,TNF,TNFRSF1B,TNFSF10,TNFSF12,WNT5B
Atherosclerosis Signaling	4.61E+00	CCL2,CCR2,CD40,COL11A2,COL1A1,COL1A2,CXCR4,ICAM1,IL1B,ITGA4,ITGB2,LYZ,MMP3,PDGFB,PDGFD,PLA2G4A,PLA2G4C,PLA2G7,PLAAT4,RELA,S100A8,SELP,SELPLG,SERPINA1,TGFB1,TNF,TNFRSF14,TNFSF12
NF-κB Activation by Viruses	4.55E+00	CD4,EIF2AK2,IKBKB,ITGA4,ITGA5,ITGAL,ITGB2,LCK,MAP3K14,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,TNFRSF14
Acute Phase Response Signaling	4.48E+00	A2M,C2,CEBPB,CP,F8,FN1,HAMP,HP,IKBKB,IL1B,IL1R1,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,MBL2,MRAS,MYD88,NFKBIE,NRAS,OSMR,PIK3R3,RALB,RAP2B,RBP1,RBP3,RELA,SERPINA1,SERPINA3,SOCS2,SOD2,TCF3,TNF,TNFRSF1B,VWF
B Cell Development	4.48E+00	CD40,CD79B,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IL7,PTPRC,RAG1
Systemic Lupus Erythematosus In T Cell Signaling Pathway	4.46E+00	BCL6,CASP1,CASP10,CASP4,CASP8,CD247,CD3D,CD44,CD70,CDC42,FAS,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DPA1,HLA-DPB1,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,ITGAL,JUN,LAT,MRAS,NOS3,NRAS,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,RPS6KB2,SELPLG,VAV1
Natural Killer Cell Signaling	4.41E+00	CD247,CD300A,FCER1G,FCGR3A/FCGR3B,INPP5D,INPP5K,KLRC4-KLRK1/KLRK1,LAIR1,LAT,LCK,LCP2,MRAS,NCK1,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,SH2D1A,SIGLEC7,TYROBP,VAV1

Fc Epsilon RI Signaling	4.41E+00	BTK,CSF2,FCER1A,FCER1G,INPP5D,INPP5K,LAT,LCP2,LYN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PLA2G4A,PLA2G4C,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,TNF,VAV1
Graft-versus-Host Disease Signaling	4.34E+00	FAS,FCER1G,GZMB,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,IL1B,PRF1,TNF
Paxillin Signaling	4.23E+00	ACTA2,ACTC1,ACTN1,ARHGEF6,ARHGEF7,CDC42,CSK,ITGA10,ITGA4,ITGA5,ITGA8,ITGAL,ITGAM,ITGAX,ITGB2,MAPK11,MAPK12,MAPK14,MRAS,NCK1,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B
PKCθ Signaling in T Lymphocytes	4.21E+00	CACNA1C,CD247,CD3D,CD4,FCER1G,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,IKBKB,JUN,LAT,LCK,LCP2,MAP3K11,MAP3K14,MRAS,NFATC4,NFKBIE,NRAS,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,RELA,VAV1
T Cell Receptor Signaling	4.15E+00	BTK,CALML5,CD247,CD3D,CD4,CD8A,CSK,IKBKB,ITK,JUN,LAT,LCK,LCP2,MRAS,NFATC4,NRAS,PIK3C2B,PIK3R3,PTPRC,PTPRH,RALB,RAP2B,RELA,VAV1
LPS-stimulated MAPK Signaling	4.07E+00	CD14,CDC42,IKBKB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,TLR4
IL-12 Signaling and Production in Macrophages	3.99E+00	CD40,CEBPB,IFNGR1,IKBKB,IL12A,IL12RB1,IRF1,IRF8,JUN,LYZ,MAPK11,MAPK12,MAPK14,MYD88,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RELA,RXRA,S100A8,SERPINA1,SPI1,TGFB1,TGFB2,TLR4,TNF
Autoimmune Thyroid Disease Signaling	3.94E+00	CD40,FAS,FCER1G,GZMB,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HLA-E,PRF1
Agranulocyte Adhesion and Diapedesis	3.81E+00	ACTA2,ACTC1,C5AR1,CCL13,CCL18,CCL2,CCL4,CCL5,CD34,CDH5,CKLF,CX3CL1,CXCL2,CXCL3,CXCR2,CXCR4,FN1,ICAM1,ICAM2,IL1B,IL1R1,ITGA4,ITGA5,ITGB2,MMP2,MMP3,MMP8,MYH11,PECAM1,SELL,SELP,SELPLG,TNF
Production of Nitric Oxide and Reactive Oxygen Species in Macrophages	3.70E+00	CDC42,CYBA,CYBB,IFNGR1,IFNGR2,IKBKB,IRF1,IRF8,JUN,LYZ,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,NCF2,NCF4,NFKBIE,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RELA,RHOBTB1,RHOC,RND3,S100A8,SERPINA1,SPI1,TLR4,TNF,TNFRSF1B
IL-4 Signaling	3.65E+00	HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,HMGA1,IL2RG,IL4R,INPP5D,INPP5K,MRAS,NFATC4,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RPS6KB2

Inflammasome pathway	3.62E+00	AIM2,CASP1,CASP8,IL1B,MYD88,NLRP1,NOD2,PYCARD,TLR4
Communication between Innate and Adaptive Immune Cells	3.58E+00	CCL4,CCL5,CD4,CD40,CD79B,CD8A,CSF2,FCER1G,HLA-DRA,HLA-DRB1,HLA-E,IL12A,IL1B,TLR1,TLR4,TLR6,TLR7,TLR8,TNF
Integrin Signaling	3.58E+00	ACTA2,ACTC1,ACTN1,ARHGAP26,ARHGEF7,ARPC1B,ARPC2,ASAP1,CDC42,ITGA10,ITGA4,ITGA5,ITGA8,ITGAL,ITGAM,ITGAX,ITGB2,MAP3K11,MRAS,NCK1,NRAS,PARVB,PDGFB,PFN1,PIK3C2B,PIK3R3,PTEN,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,TSPAN7,VASP,WAS,WIPF1
GP6 Signaling Pathway	3.51E+00	BTK,CALML5,COL11A2,COL13A1,COL15A1,COL1A1,COL1A2,COL21A1,COL4A1,COL4A2,COL5A2,COL6A3,FCER1G,LAMA2,LAMA4,LAT,LCP2,LYN,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3
Apoptosis Signaling	3.46E+00	BAK1,BAX,BCL2A1,CASP10,CASP8,CDK1,FAS,GAS2,IKBKB,MAP3K14,MAP4K4,MCL1,MRAS,NFKBIE,NRAS,PRKCE,RALB,RAP2B,RELA,TNF,TNFRSF1B,TP53
NF-κB Signaling	3.41E+00	CASP8,CD40,EIF2AK2,FCER1G,FLT4,IKBKB,IL1B,IL1R1,KDR,LCK,MAP3K14,MAP4K4,MRAS,MYD88,NFKBIE,NRAS,PDGFRA,PIK3C2B,PIK3R3,PRKCB,RALB,RAP2B,RELA,TGFBR2,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TNFAIP3,TNFRSF1B
IL-6 Signaling	3.40E+00	A2M,CD14,CEBPB,COL1A1,HSPB3,IKBKB,IL1B,IL1R1,IL1RL1,JUN,MAP3K14,MAP4K4,MAPK11,MAPK12,MAPK14,MCL1,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,TNF,TNFRSF1B
Apelin Endothelial Signaling Pathway	3.40E+00	ADCY1,ADCY3,APLNR,CALML5,CCL2,ICAM1,JUN,KLF2,MAPK12,MEF2C,MRAS,NOS3,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,RPS6KB2,TEK
Colorectal Cancer Metastasis Signaling	3.35E+00	ADCY1,ADCY3,ARRB1,BAX,BIRC5,CCND1,CDC42,FZD4,GNG11,GNG7,IFNGR1,JUN,MAPK12,MMP2,MMP3,MMP8,MRAS,MYC,NRAS,PGF,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3,TCF3,TGFB1,TGFB2,TGFBR2,TLR1,TLR4,TLR6,TLR7,TLR8,TNF,TP53,WNT5B
fMLP Signaling in Neutrophils	3.34E+00	ARPC1B,ARPC2,CALML5,CDC42,CYBB,FPR1,GNG11,GNG7,ITPR3,MRAS,NCF2,NFATC4,NFKBIE,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,WAS
Primary Immunodeficiency Signaling	3.34E+00	ADA,BTK,CD3D,CD4,CD40,CD8A,IL2RG,LCK,PTPRC,RAG1,RFX5,TAP1,TAP2

HOTAIR Regulatory Pathway	3.34E+00	AR,ATG7,CD44,COL1A1,COL1A2,DNMT3B,EZH2,FOXM1,ICAM1,IRF1,JAM2,MMP2,MMP3,MMP8,MYC,PIK3C2B,PIK3R3,PTEN,RBBP4,RELA,REST,RHOC,SNAI2,TCF3,TGFB1,TLR4,TWIST1,WNT5B
Actin Nucleation by ARP-WASP Complex	3.29E+00	ARPC1B,ARPC2,CDC42,ITGA4,ITGA5,MRAS,NCK1,NRAS,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,VASP,WAS,WIPF1
CCR5 Signaling in Macrophages	3.24E+00	CACNA1C,CALML5,CCL4,CCL5,CD247,CD3D,CD4,FAS,FCER1G,GNG11,GNG7,JUN,MAPK11,MAPK12,MAPK14,MRAS,PRKCB,PRKCE,PRKCH,PRKD3
Osteoarthritis Pathway	3.23E+00	ACVRL1,CASP1,CASP10,CASP4,CASP8,CEBPB,CXCR2,DDIT4,DKK1,FGF2,FGF8,FN1,FRZB,FZD4,IL1B,IL1R1,IL1RL1,ITGA4,ITGA5,MEF2C,MMP3,NOTCH1,PGF,RELA,S100A8,S100A9,SMAD7,SMAD9,SOX9,TCF3,TGFB1,TGFBR2,TLR4,TNF,TNFRSF1B
Glioma Signaling	3.20E+00	CALML5,CAMK1,CAMK1D,CAMK1G,CCND1,CDKN2B,E2F3,IGF2,MRAS,NRAS,PDGFB,PDGFD,PDGFRA,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,PTEN,RALB,RAP2B,TP53
VDR/RXR Activation	3.15E+00	CCL5,CD14,CEBPA,CEBPB,COL13A1,CSF2,CYP24A1,IGFBP5,IGFBP6,IL12A,IL1RL1,KLF4,PRKCB,PRKCE,PRKCH,PRKD3,RXRA,TGFB2,THBD
Agrin Interactions at Neuromuscular Junction	3.14E+00	ACTA2,ACTC1,ARHGEF6,ARHGEF7,CDC42,ITGA4,ITGA5,ITGAL,ITGB2,JUN,LAMA2,MAPK12,MRAS,NRAS,RAC2,RALB,RAP2B,UTRN
Death Receptor Signaling	3.11E+00	ACTA2,ACTC1,ARHGDIB,CASP10,CASP8,FAS,GAS2,HSPB3,IKBKB,MAP3K14,MAP4K4,NFKBIE,PARP12,PARP8,RELA,TNF,TNFRSF10B,TNFRSF1B,TNFSF10,TNFSF12
Chemokine Signaling	2.99E+00	CALML5,CAMK1,CAMK1D,CAMK1G,CCL13,CCL2,CCL4,CCL5,CXCR4,JUN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PRKCB,RALB,RAP2B
Opioid Signaling Pathway	2.98E+00	ADCY1,ADCY3,AP2S1,ARRB1,ARRB2,BLK,CACNA1C,CALML5,CAMK1,CAMK1D,CAMK1G,CDC42,FGR,GNG11,GNG7,HCK,ITPR3,LCK,LYN,MAPK12,MRAS,MYC,NOS3,NRAS,PENK,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RGS16,RGS19,RGS3,RGS4,RPS6KA3,RPS6KB2,SIGMAR1
Endothelin-1 Signaling	2.96E+00	ADCY1,ADCY3,CASP1,CASP10,CASP4,CASP8,EDNRA,GNA14,ITPR3,JUN,MAPK11,MAPK12,MAPK14,MRAS,MYC,NOS3,NRAS,PIK3C2B,PIK3R3,PLA2G4A,PLA2G4C,PLA2G7,PLAAT4,PRKCB,PRKCE,PRKCH,PRKD3,PTGS1,RALB,RAP2B

Molecular Mechanisms of Cancer	2.94E+00	ADCY1,ADCY3,ARHGEF15,ARHGEF2,ARHGEF6,ARHGEF7,BAK1,BAX,BRCA1,CASP10,CASP8,CCND1,CCNE2,CDC25C,CDC42,CDK1,CDK12,CDKN2B,E2F3,FAS,FZD4,GNA14,ITGA4,ITGA5,JUN,MAPK11,MAPK12,MAPK14,MAX,MRAS,MYC,NFKBIE,NOTCH1,NRAS,PIK3C2B,PIK3R3,PMAIP1,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3,SMAD7,SMAD9,TCF3,TGFB1,TGFB2,TGFBR2,TP53,WNT5B
Thrombin Signaling	2.93E+00	ADCY1,ADCY3,ARHGEF15,ARHGEF2,ARHGEF6,CAMK1,CAMK1D,CAMK1G,CDC42,GATA2,GATA3,GNA14,GNG11,GNG7,IKBKB,ITPR3,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RELA,RHOBTB1,RHOC,RND3
PI3K Signaling in B Lymphocytes	2.90E+00	BLK,BTK,CALML5,CD180,CD40,CD79B,DAPP1,IKBKB,IL4R,INPP5D,ITPR3,JUN,LYN,MRAS,NFATC4,NFKBIE,NRAS,PRKCB,PTEN,PTPRC,RALB,RAP2B,RELA,TLR4,VAV1
Gαq Signaling	2.85E+00	AGTR1,BTK,CALML5,CDC42,CSK,GNA14,GNG11,GNG7,GRM5,IKBKB,ITPR3,MRAS,NFATC4,NFKBIE,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RELA,RGS16,RGS4,RHOBTB1,RHOC,RND3
Tumoricidal Function of Hepatic Natural Killer Cells	2.82E+00	BAX,CASP8,FAS,GZMB,ICAM1,ITGAL,M6PR,PRF1,SRGN
VEGF Family Ligand-Receptor Interactions	2.79E+00	FLT4,KDR,MRAS,NOS3,NRAS,NRP1,NRP2,PGF,PIK3C2B,PIK3R3,PLA2G4A,PLA2G4C,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B
Nur77 Signaling in T Lymphocytes	2.75E+00	CALML5,CD247,CD3D,FCER1G,HDAC9,HLA-DMA,HLA-DMB,HLA-DOA,HLA-DQA1,HLA-DQB1,HLA-DRA,HLA-DRB1,RXRA
Role of Tissue Factor in Cancer	2.75E+00	ARRB1,ARRB2,BLK,CDC42,CSF2,FGR,GNA14,HCK,IL1B,LCK,LYN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PTEN,RALB,RAP2B,RPS6KA3,TP53
Sperm Motility	2.74E+00	BLK,BTK,CALML5,CNGA1,CSF1R,CSK,EPHB4,FES,FGR,FLT4,HCK,ITK,ITPR3,KDR,LCK,LTK,LYN,MAP3K11,MATK,MRAS,PDE2A,PDGFRA,PLA2G4A,PLA2G4C,PLA2G7,PLAAT4,PRKCB,PRKCE,PRKCH,PRKD3,RET,ROR2,TEK,TIE1
Macropinocytosis Signaling	2.71E+00	CD14,CDC42,CSF1R,ITGA5,ITGB2,MRAS,NRAS,PDGFB,PDGFD,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B

HGF Signaling	2.66E+00	CCND1,CDC42,ELF4,ELK3,ETS1,ETS2,ITGA4,ITGA5,JUN,MAP3K11,MAP3K14,MAPK12,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B
IL-10 Signaling	2.61E+00	CD14,IKBKB,IL10RA,IL1B,IL1R1,IL1RL1,IL4R,JUN,MAP3K14,MAP4K4,MAPK11,MAPK12,MAPK14,NFKBIE,RELA,TNF
Virus Entry via Endocytic Pathways	2.61E+00	ACTA2,ACTC1,AP1S2,AP2S1,CDC42,HLA-E,ITGA4,ITGA5,ITGAL,ITGB2,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B
Regulation of IL-2 Expression in Activated and Anergic T Lymphocytes	2.61E+00	CALML5,CD247,CD3D,IKBKB,JUN,LAT,MAPK12,MRAS,NFATC4,NFKBIE,NRAS,RALB,RAP2B,RELA,TGFB1,TGFB2,TGFBR2,VAV1
UVC-Induced MAPK Signaling	2.59E+00	JUN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,TP53
IL-15 Production	2.56E+00	BLK,BTK,CSF1R,CSK,EPHB4,FES,FGR,FLT4,HCK,IRF1,ITK,KDR,LCK,LTK,LYN,MAP3K11,MATK,PDGFRA,RELA,RET,ROR2,TEK,TIE1
IL-15 Signaling	2.56E+00	CSF2,IL15RA,IL2RB,IL2RG,LCK,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,TNF
MIF Regulation of Innate Immunity	2.55E+00	CD14,CD74,JUN,LY96,MAPK12,NFKBIE,PLA2G4A,PLA2G4C,RELA,TLR4,TP53
Mechanisms of Viral Exit from Host Cells	2.55E+00	ACTA2,ACTC1,LMNB1,LMNB2,NEDD4,PRKCB,PRKCE,PRKCH,PRKD3,SH3GL1,SH3GLB1
Inhibition of Angiogenesis by TSP1	2.50E+00	HSPG2,JUN,KDR,MAPK11,MAPK12,MAPK14,NOS3,TGFB1,TGFBR2,TP53
Differential Regulation of Cytokine Production in Macrophages and T Helper Cells by IL-17A and IL-17F	2.49E+00	CCL2,CCL4,CCL5,CSF2,IL12A,IL1B,TNF
Renin-Angiotensin Signaling	2.47E+00	ADCY1,ADCY3,AGTR1,CCL2,CCL5,ITPR3,JUN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA,TNF
Caveolar-mediated Endocytosis Signaling	2.43E+00	ACTA2,ACTC1,CAVIN1,CD48,FLOT1,FLOT2,HLA-E,ITGA10,ITGA4,ITGA5,ITGA8,ITGAL,ITGAM,ITGAX,ITGB2,PTPN1
GM-CSF Signaling	2.33E+00	BCL2A1,CCND1,CSF2,ETS1,HCK,LYN,MRAS,NRAS,PIK3C2B,PIK3R3,PIM1,PRKCB,RALB,RAP2B,RUNX1
Acute Myeloid Leukemia Signaling	2.33E+00	CCND1,CEBPA,CSF1R,CSF3R,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,PIM1,PML,RALB,RAP2B,RELA,RPS6KB2,RUNX1,SPI1,TCF3

p38 MAPK Signaling	2.32E+00	FAS,HSPB3,IL1B,IL1R1,IL1RL1,MAPK11,MAPK12,MAPK14,MAX,MEF2C,MYC,PLA2G4A,PLA2G4C,RPS6KA3,RPS6KB2,TGFB1,TGFB2,TGFBR2,TNF,TNFRSF1B,TP53
Role of MAPK Signaling in the Pathogenesis of Influenza	2.20E+00	BAX,CCL2,CCL5,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PLA2G4A,PLA2G4C,PLA2G7,PLAAT4,RALB,RAP2B,TNF
Complement System	2.20E+00	C1QA,C1QB,C2,C3AR1,C5AR1,CFD,ITGAM,ITGAX,ITGB2,MBL2
CXCR4 Signaling	2.18E+00	ADCY1,ADCY3,CD4,CDC42,CXCR4,ELMO1,GNA14,GNG11,GNG7,ITPR3,JUN,LYN,MAPK12,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3
PPAR Signaling	2.16E+00	IKBKB,IL1B,IL1R1,IL1RL1,JUN,MAP3K14,MAP4K4,MRAS,NFKBIE,NRAS,PDGFB,PDGFD,PDGFRA,RALB,RAP2B,RELA,RXRA,TNF,TNFRSF1B
Germ Cell-Sertoli Cell Junction Signaling	2.11E+00	A2M,ACTA2,ACTC1,ACTN1,AFDN,CDC42,MAP3K11,MAP3K14,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,SORBS1,TGFB1,TGFB2,TGFBR2,TNF,TUBA1A,TUBB6
Ephrin Receptor Signaling	2.09E+00	ARHGEF15,ARPC1B,ARPC2,CDC42,CXCR4,EFNA1,EFNB3,EPHB4,GNA14,GNG11,GNG7,ITGA4,ITGA5,MAP3K14,MAP4K4,MRAS,NCK1,NRAS,PDGFB,PDGFD,PGF,RAC2,RALB,RAP2B,RGS3,SORBS1,WAS,WIPF1
Angiopoietin Signaling	2.08E+00	BIRC5,DOK2,IKBKB,MRAS,NCK1,NFKBIE,NOS3,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,TEK,TIE1
CD40 Signaling	2.04E+00	CD40,ICAM1,IKBKB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,NFKBIE,PIK3C2B,PIK3R3,PTGS1,RELA,TNFAIP3
Breast Cancer Regulation by Stathmin1	2.04E+00	ADCY1,ADCY3,ARHGEF15,ARHGEF2,ARHGEF6,ARHGEF7,CALML5,CAMK1,CAMK1D,CAMK1G,CCNE2,CDC42,CDK1,E2F3,GNG11,GNG7,ITPR3,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,TP53,TUBA1A,TUBB6
IL-7 Signaling Pathway	2.02E+00	BAK1,BAX,BCL6,CCND1,IL2RG,IL7,JUN,LYN,MAPK11,MAPK12,MAPK14,MCL1,MYC,PIK3C2B,PIK3R3
Reelin Signaling in Neurons	2.02E+00	ARHGEF15,ARHGEF2,ARHGEF6,BLK,FGR,HCK,ITGA4,ITGA5,ITGAL,ITGB2,LCK,LYN,MAP3K11,MAPK12,PIK3C2B,PIK3R3
Prolactin Signaling	2.02E+00	CEBPB,IRF1,JUN,MRAS,MYC,NMI,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,SOCS2
Sumoylation Pathway	2.02E+00	AR,ARHGDIB,CDC42,CEBPA,DNMT3A,ETS1,FAS,ISG20,JUN,MAPK12,PML,RAC2,RFC2,RHOBTB1,RHOC,RND3,SP100,TP53,UBE2I

Actin Cytoskeleton Signaling	1.99E+00	ACTA2,ACTC1,ACTN1,ARHGEF6,ARHGEF7,ARPC1B,ARPC2,CD14,CDC42,CSK,FGD1,FGF2,FGF8,FN1,ITGA4,ITGA5,MATK,MRAS,MYH11,NCKAP1L,NRAS,PDGFB,PDGFD,PFN1,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,TMSB10/TMSB4X,VAV1,WAS
Role of NFAT in Cardiac Hypertrophy	1.99E+00	ADCY1,ADCY3,CACNA1C,CALML5,CAMK1,CAMK1D,CAMK1G,GNG11,GNG7,HDAC7,HDAC9,ITPR3,MAPK11,MAPK12,MAPK14,MEF2C,MRAS,NFATC4,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RCAN2,TGFB1,TGFB2,TGFBR2
UVB-Induced MAPK Signaling	1.99E+00	JUN,MAPK11,MAPK12,MAPK14,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RPS6KA3,TP53
PAK Signaling	1.98E+00	ARHGEF6,ARHGEF7,CDC42,ITGA4,ITGA5,MAPK12,MRAS,NCK1,NRAS,PAK1IP1,PDGFB,PDGFD,PDGFRA,PIK3C2B,PIK3R3,RALB,RAP2B,TNF
Epithelial Adherens Junction Signaling	1.98E+00	ACTA2,ACTC1,ACTN1,AFDN,ARPC1B,ARPC2,CDC42,MRAS,MYH11,NOTCH1,NOTCH3,NOTCH4,NRAS,PTEN,PTPRM,RALB,RAP2B,SNAI2,SORBS1,TCF3,TGFB2,TGFBR2,TUBA1A,TUBB6,WAS
PEDF Signaling	1.98E+00	CASP8,FAS,IKBKB,MAPK11,MAPK12,MAPK14,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,SOD2,TP53
Differential Regulation of Cytokine Production in Intestinal Epithelial Cells by IL-17A and IL-17F	1.96E+00	CCL2,CCL4,CCL5,CSF2,IL12A,IL1B,TNF
SAPK/JNK Signaling	1.94E+00	CDC42,FCER1G,GNG11,GNG7,JUN,LCK,MAP3K11,MAP4K4,MAPK12,MINK1,MRAS,NRAS,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,TP53
HER-2 Signaling in Breast Cancer	1.94E+00	CCND1,CCNE2,CDC42,ITGB2,MMP2,MRAS,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,TP53
Cholecystokinin/Gastrin-mediated Signaling	1.92E+00	CDC42,IL1B,ITPR3,JUN,MAPK12,MAPK14,MEF2C,MRAS,NRAS,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,TNF
Role of Osteoblasts, Osteoclasts and Chondrocytes in Rheumatoid Arthritis	1.91E+00	CALML5,COL1A1,CSF1R,CSF2,CTSK,DKK1,DKK3,FRZB,FZD4,IKBKB,IL1B,IL1R1,IL1RL1,IL7,ITGA5,JUN,MAP3K14,MAPK12,MAPK14,MMP3,MMP8,NFATC4,NFKBIE,PIK3C2B,PIK3R3,RELA,SMAD9,TCF3,TGFB1,TNF,TNFRSF1B,WNT5B
p53 Signaling	1.90E+00	BAX,BIRC5,BRCA1,CCND1,FAS,HDAC9,JUN,MAPK14,PIK3C2B,PIK3R3,PMAIP1,PML,PPP1R13B,PTEN,SCO2,SNAI2,TNFRSF10B,TP53

Glioma Invasiveness Signaling	1.90E+00	CD44,CDC42,MMP2,MRAS,NRAS,PIK3C2B,PIK3R3,PLAU,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3
Wnt/Œ≤-catenin Signaling	1.90E+00	CCND1,CD44,CDH5,DKK1,DKK3,FRZB,FZD4,JUN,MYC,NR5A2,RARB,RARG,SOX11,SOX13,SOX17,SOX18,SOX4,SOX9,TCF3,TGFB1,TGFB2,TGFBR2,TLE1,TLE3,TP53,WNT5B
IL-17A Signaling in Fibroblasts	1.90E+00	CCL2,CEBPB,IKBKB,JUN,MAPK11,MAPK12,MAPK14,NFKBIE,RELA
Induction of Apoptosis by HIV1	1.86E+00	BAK1,BAX,CASP8,CXCR4,FAS,IKBKB,MAP3K14,MAPK12,NFKBIE,RELA,TNF,TNFRSF1B,TP53
Role of PKR in Interferon Induction and Antiviral Response	1.83E+00	CASP8,EIF2AK2,EIF2S1,IKBKB,IRF1,MAPK14,NFKBIE,RELA,TNF,TP53
Cytotoxic T Lymphocyte-mediated Apoptosis of Target Cells	1.83E+00	CASP8,CD247,CD3D,FAS,FCER1G,GZMB,HLA-E,PRF1
TNFR2 Signaling	1.83E+00	IKBKB,JUN,MAP3K14,NFKBIE,RELA,TNF,TNFAIP3,TNFRSF1B
Activation of IRF by Cytosolic Pattern Recognition Receptors	1.81E+00	CD40,IFIH1,IFIT2,IKBKB,IRF7,IRF9,ISG15,JUN,MAPK12,NFKBIE,RELA,TNF,ZBP1
FAK Signaling	1.81E+00	ACTA2,ACTC1,ARHGAP26,ARHGEF6,ARHGEF7,ASAP1,CSK,ITGA4,ITGA5,MRAS,NRAS,PIK3C2B,PIK3R3,PTEN,RALB,RAP2B,WAS
Sertoli Cell-Sertoli Cell Junction Signaling	1.81E+00	A2M,ACTA2,ACTC1,ACTN1,AFDN,CDC42,EPB41,ITGA4,ITGA5,JAM2,JUN,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,MRAS,NOS3,NRAS,PTEN,RALB,RAP2B,SORBS1,TNF,TUBA1A,TUBB6,WAS
Airway Pathology in Chronic Obstructive Pulmonary Disease	1.80E+00	CXCL3,MMP2,MMP8,TNF
Sphingosine-1-phosphate Signaling	1.79E+00	ADCY1,ADCY3,CASP1,CASP10,CASP4,CASP8,CDC42,PDGFB,PDGFD,PDGFRA,PIK3C2B,PIK3R3,RAC2,RHOBTB1,RHOC,RND3,S1PR1,S1PR4
Mouse Embryonic Stem Cell Pluripotency	1.79E+00	FZD4,ID1,ID2,ID3,LIFR,MAPK11,MAPK12,MAPK14,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,SMAD9,TCF3,TP53
HIF1Œ± Signaling	1.76E+00	JUN,LDHA,MAPK11,MAPK12,MAPK14,MMP2,MMP3,MMP8,MRAS,NAA10,NOS3,NRAS,PGF,PIK3C2B,PIK3R3,RALB,RAP2B,SLC2A3,TP53
Coagulation System	1.76E+00	A2M,F12,F8,PLAT,PLAU,SERPINA1,TFPI,THBD,VWF
IL-17 Signaling	1.76E+00	CCL2,CEBPB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,MMP3,MRAS,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA

Small Cell Lung Cancer Signaling	1.76E+00	CCND1,CCNE2,CDKN2B,IKBKB,MAX,MYC,NFKBIE,PIK3C2B,PIK3R3,PTEN,RARB,RELA,RXRA,TP53
MIF-mediated Glucocorticoid Regulation	1.76E+00	CD14,CD74,LY96,NFKBIE,PLA2G4A,PLA2G4C,RELA,TLR4
MSP-RON Signaling Pathway	1.72E+00	ACTA2,ACTC1,CCL2,CCR2,F12,IL12A,ITGAM,ITGB2,PIK3C2B,PIK3R3,TLR4,TNF
Apelin Liver Signaling Pathway	1.68E+00	APLNR,COL11A2,COL1A1,COL1A2,FAS,MAPK12,TNF
Glioblastoma Multiforme Signaling	1.67E+00	CCND1,CDC42,E2F3,FZD4,IGF2,ITPR3,MRAS,MYC,NRAS,PDGFB,PDGFD,PDGFRA,PIK3C2B,PIK3R3,PTEN,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,TCF3,TP53,WNT5B
IL-1 Signaling	1.63E+00	ADCY1,ADCY3,GNA14,GNG11,GNG7,IKBKB,IL1R1,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,MRAS,MYD88,NFKBIE,RELA
Adipogenesis pathway	1.63E+00	ATG7,CEBPA,CEBPB,EGR2,EZH2,FABP4,FGF2,FZD4,GTF2H5,HDAC7,HDAC9,KLF3,NFATC4,RBBP4,RBP1,SAP30,SMAD9,SOX9,TGFB1,TNF,TP53
B Cell Activating Factor Signaling	1.62E+00	IKBKB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,NFATC4,NFKBIE,RELA
CCR3 Signaling in Eosinophils	1.62E+00	CALML5,GNG11,GNG7,ITPR3,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PIK3C2B,PIK3R3,PLA2G4A,PLA2G4C,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B
April Mediated Signaling	1.62E+00	IKBKB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,NFATC4,NFKBIE,RELA
Signaling by Rho Family GTPases	1.62E+00	ACTA2,ACTC1,ARHGEF15,ARHGEF2,ARHGEF6,ARHGEF7,ARPC1B,ARPC2,CDC42,CDH11,CDH13,CDH5,CYBB,GNA14,GNG11,GNG7,ITGA4,ITGA5,JUN,MAP3K11,MAPK12,MRAS,NCF2,NEDD4,PIK3C2B,PIK3R3,RAC2,RELA,RHOBTB1,RHOC,RND3,WAS,WIPF1
RhoGDI Signaling	1.62E+00	ACTA2,ACTC1,ARHGAP4,ARHGDIB,ARHGEF15,ARHGEF2,ARHGEF6,ARHGEF7,ARPC1B,ARPC2,CD44,CDC42,CDH11,CDH13,CDH5,DGKZ,GNA14,GNG11,GNG7,ITGA4,ITGA5,MRAS,RAC2,RHOBTB1,RHOC,RND3
4-1BB Signaling in T Lymphocytes	1.60E+00	IKBKB,JUN,MAP3K14,MAPK11,MAPK12,MAPK14,NFKBIE,RELA
IL-17A Signaling in Gastric Cells	1.60E+00	CCL5,JUN,MAPK11,MAPK12,MAPK14,RELA,TNF
GNRH Signaling	1.59E+00	ADCY1,ADCY3,CACNA1C,CALML5,CDC42,GNA14,GNG11,GNG7,ITPR3,JUN,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,MMP2,MRAS,NRAS,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA

Chronic Myeloid Leukemia Signaling	1.59E+00	CCND1,E2F3,HDAC7,HDAC9,IKBKB,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,TGFB1,TGFB2,TGFBR2,TP53
ErbB Signaling	1.57E+00	CDC42,JUN,MAPK11,MAPK12,MAPK14,MRAS,NCK1,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B
Adrenomedullin signaling pathway	1.57E+00	ADCY1,ADCY3,BAX,CALCRL,CALML5,CEBPB,CSK,GNA14,IL1B,ITPR3,MAPK11,MAPK12,MAPK14,MATK,MAX,MMP2,MRAS,NOS3,NRAS,PIK3C2B,PIK3R3,RALB,RAMP2,RAP2B,RELA,RXRA,TNF
Telomerase Signaling	1.55E+00	ELF4,ELK3,ETS1,ETS2,HDAC7,HDAC9,IL2RB,IL2RG,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,TINF2,TP53
3-phosphoinositide Degradation	1.55E+00	CDC25C,DOT1L,DUSP11,DUSP2,DUSP5,INPP4B,INPP5D,INPP5K,NUDT1,NUDT11,NUDT3,PPFIA3,PPP1R13B,PTEN,PTPN1,PTPRC,PTPRH,PTPRM,STYXL1,TPTE
PTEN Signaling	1.55E+00	CCND1,CDC42,FLT4,IKBKB,INPP5D,INPP5K,ITGA4,ITGA5,KDR,MRAS,NRAS,PDGFRA,PIK3R3,PTEN,RAC2,RALB,RAP2B,RELA,RPS6KB2,TGFBR2
Thrombopoietin Signaling	1.52E+00	JUN,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B
Gα12/13 Signaling	1.52E+00	BTK,CDC42,CDH11,CDH13,CDH5,IKBKB,JUN,LPAR6,MAPK12,MEF2C,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,TBXA2R,VAV1
Glucocorticoid Receptor Signaling	1.50E+00	A2M,ADRB2,AR,CCL13,CCL2,CCL5,CD163,CD247,CD3D,CEBPA,CEBPB,CSF2,CXCL3,GTF2H5,ICAM1,IKBKB,IL1B,JUN,KRT17,MAP3K14,MAPK11,MAPK12,MAPK14,MRAS,NFATC4,NFKBIE,NRAS,PBX1,PIK3C2B,PIK3R3,PLAU,POLR2D,RALB,RAP2B,RELA,TAF12,TGFB1,TGFB2,TGFBR2,TNF,UBE2I,VIPR1
RAR Activation	1.49E+00	ADCY1,ADCY3,AKR1B10,CSK,GTF2H5,JUN,MAPK11,MAPK12,MAPK14,PIK3R3,PML,PRKCB,PRKCE,PRKCH,PRKD3,PTEN,RARB,RARG,RBP1,RBP3,RELA,RXRA,SMAD7,SMAD9,TGFB1,TGFB2,TRIM24
Thyroid Cancer Signaling	1.48E+00	CCND1,MRAS,MYC,NRAS,RALB,RAP2B,RET,RXRA,TCF3,TP53
Myc Mediated Apoptosis Signaling	1.48E+00	BAX,CASP8,FAS,MAPK12,MRAS,MYC,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,TP53
PDGF Signaling	1.48E+00	EIF2AK2,INPP5D,INPP5K,JUN,MRAS,MYC,NRAS,PDGFB,PDGFD,PDGFRA,PIK3C2B,PIK3R3,PRKCB,RALB,RAP2B

Systemic Lupus Erythematosus Signaling	1.46E+00	CD247,CD3D,CD40,CD79B,FCER1G,FCGR3A/FCGR3B,HLA-E,IL1B,INPP5D,JUN,LAT,LCK,LSM7,LYN,MRAS,NFATC4,NRAS,PIK3C2B,PIK3R3,PRPF38B,PTPRC,RALB,RAP2B,SNRNP40,TLR7,TNF
Superpathway of Inositol Phosphate Compounds	1.46E+00	CDC25C,DOT1L,DUSP11,DUSP2,DUSP5,INPP5A,INPP5D,INPP5K,ITPKB,NUDT1,NUDT11,NUDT3,PIK3C2B,PIK3R3,PIP4K2A,PPFIA3,PPP1R13B,PTEN,PTPN1,PTPRC,PTPRH,PTPRM,STYXL1,TPTE
TGF-β Signaling	1.46E+00	CDC42,IRF7,JUN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,RALB,RAP2B,RUNX3,SMAD7,SMAD9,TGFB1,TGFB2,TGFBR2
Regulation of the Epithelial-Mesenchymal Transition Pathway	1.44E+00	ETS1,FGF2,FGF8,FZD4,HMGA2,ID2,JAG2,MMP2,MRAS,NOTCH1,NOTCH3,NOTCH4,NRAS,PDGFD,PIK3C2B,PIK3R3,RALB,RAP2B,RELA,SNAI2,TCF3,TGFB1,TGFB2,TGFBR2,TWIST1,WNT5B
Nitric Oxide Signaling in the Cardiovascular System	1.42E+00	ATP2A3,CACNA1C,CALML5,FLT4,ITPR3,KDR,NOS3,PDE2A,PDE5A,PGF,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3
Role of JAK1 and JAK3 in Œ≥c Cytokine Signaling	1.39E+00	FES,IL15RA,IL2RB,IL2RG,IL4R,IL7,MRAS,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B
Cell Cycle: G1/S Checkpoint Regulation	1.39E+00	CCND1,CCNE2,CDKN2B,E2F3,HDAC7,HDAC9,MAX,MYC,PAK1IP1,TGFB1,TGFB2,TP53
Granzyme B Signaling	1.39E+00	CASP8,GZMB,LMNB1,LMNB2,PRF1
VEGF Signaling	1.39E+00	ACTA2,ACTC1,ACTN1,EIF2B4,EIF2S1,FLT4,KDR,MRAS,NOS3,NRAS,PGF,PIK3C2B,PIK3R3,PRKCB,RALB,RAP2B
Axonal Guidance Signaling	1.38E+00	ADAM12,ADAM15,ADAMTS1,ARHGEF15,ARHGEF6,ARHGEF7,ARPC1B,ARPC2,CDC42,CXCR4,EFNA1,EFNB3,EPHB4,FES,FZD4,GNA14,GNG11,GNG7,ITGA4,ITGA5,MMP2,MMP3,MMP8,MRAS,NCK1,NFATC4,NRAS,NRP1,NRP2,PDGFB,PDGFD,PFN1,PGF,PIK3C2B,PIK3R3,PLXNB3,PRKCB,PRKCE,PRKCH,PRKD3,RAC2,RALB,RAP2B,RGS3,SEMA3F,SEMA4C,SEMA6A,TUBA1A,TUBB6,VASP,WAS,WIPF1,WNT5B
β-Adrenergic Signaling	1.37E+00	ADCY1,ADCY3,CALML5,GNG11,GNG7,ITPR3,MRAS,NRAS,PRKCB,PRKCE,PRKCH,PRKD3,PYGL,RALB,RAP2B
GDNF Family Ligand-Receptor Interactions	1.37E+00	CDC42,DOK2,ITPR3,JUN,MAPK12,MRAS,NCK1,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RET
Superpathway of D-myo-inositol (1,4,5)-trisphosphate Metabolism	1.37E+00	INPP1,INPP5A,INPP5D,INPP5K,ITPKB,PTEN

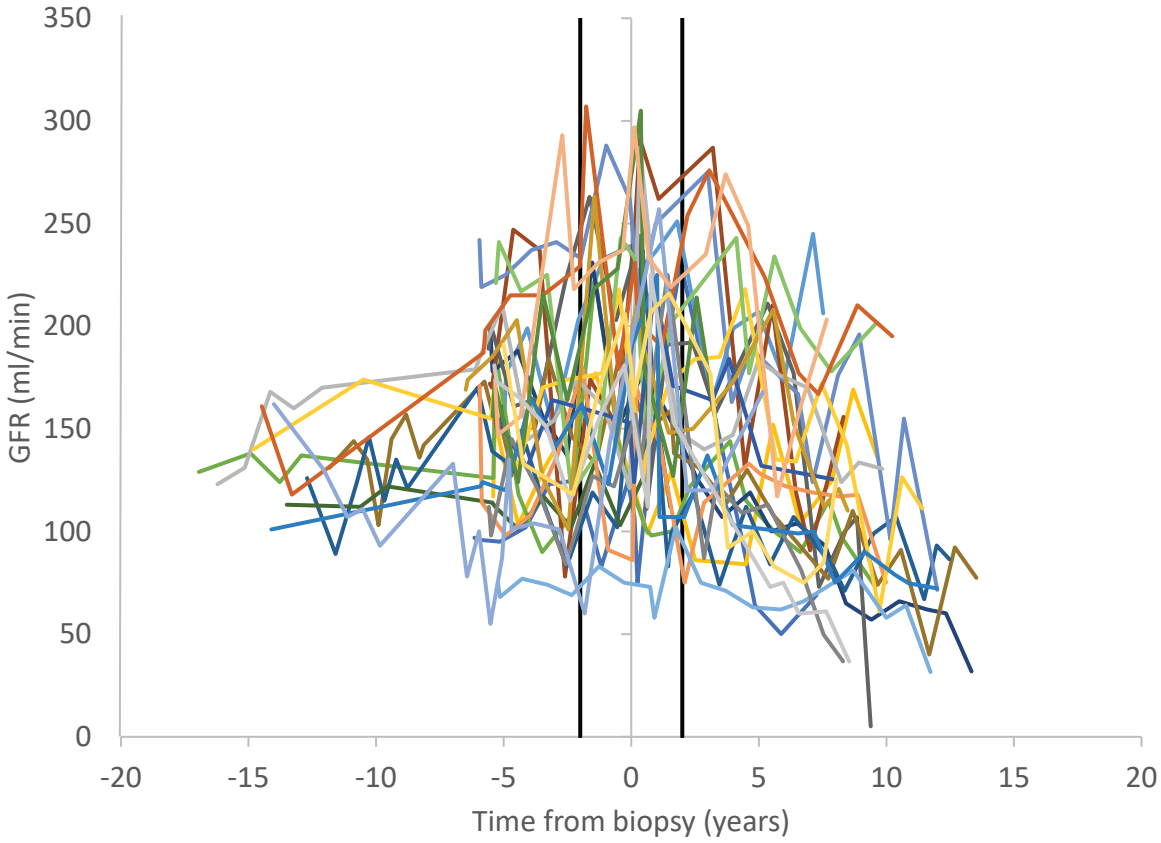
UVA-Induced MAPK Signaling	1.37E+00	JUN,MAPK11,MAPK12,MAPK14,MRAS,NRAS,PARP12,PARP8,PIK3C2B,PIK3R3,RALB,RAP2B,RPS6KA3,RPS6KB2,TP53
Rac Signaling	1.35E+00	ARPC1B,ARPC2,CD44,CDC42,CYBB,ITGA4,ITGA5,JUN,MAP3K11,MRAS,NCF2,NRAS,PIK3C2B,PIK3R3,RALB,RAP2B,RELA
Hematopoiesis from Pluripotent Stem Cells	1.35E+00	CD247,CD3D,CD4,CD8A,CSF2,FCER1G,IL12A,IL7
Leukotriene Biosynthesis	1.35E+00	DPEP2,GGT5,LTC4S,MGST2
Erythropoietin Signaling	1.33E+00	JUN,MRAS,NFKBIE,NRAS,PIK3C2B,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,RALB,RAP2B,RELA
Cardiac Hypertrophy Signaling	1.33E+00	ADCY1,ADCY3,ADRB2,CACNA1C,CALML5,CDC42,EIF2B4,GNA14,GNG11,GNG7,JUN,MAP3K11,MAP3K14,MAPK11,MAPK12,MAPK14,MEF2C,MRAS,NFATC4,NRAS,PIK3C2B,PIK3R3,RAC2,RALB,RAP2B,RHOBTB1,RHOC,RND3,TGFB1,TGFB2,TGFBR2
Neuregulin Signaling	1.30E+00	ITGA4,ITGA5,MATK,MRAS,MYC,NRAS,PIK3R3,PRKCB,PRKCE,PRKCH,PRKD3,PTEN,RALB,RAP2B,RPS6KB2
D-myo-inositol (1,3,4)-trisphosphate Biosynthesis	1.30E+00	INPP5A,INPP5D,INPP5K,ITPKB,PTEN
Th17 Activation Pathway	1.30E+00	CCR6,CSF2,FCER1G,IL12A,IL12RB1,IL1B,IL1R1,MYD88,NFATC4,RELA,RUNX1

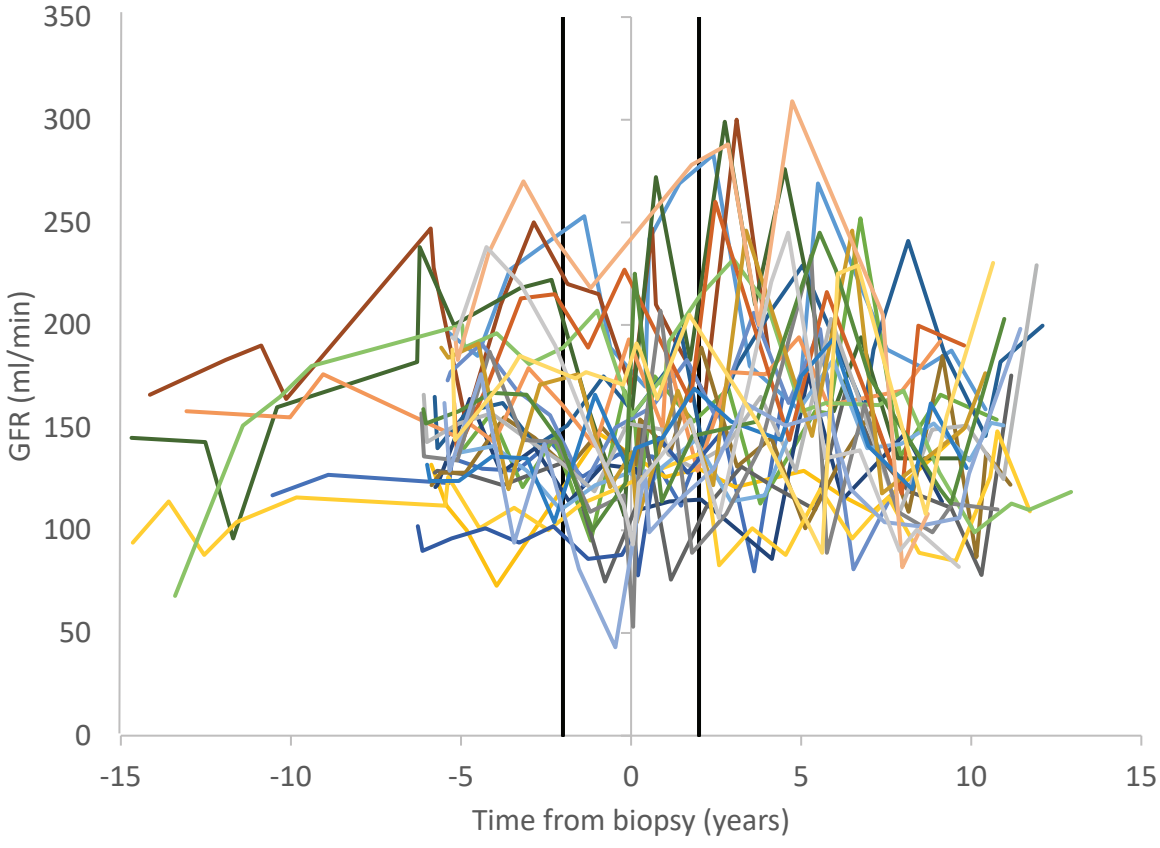
Supplemental Table S7: Clinical and morphometric measures for the participants who contributed single-cell expression data from kidney biopsies

Characteristic	N	
Male sex (%)	44	14 (31.8%)
Age (years)	44	41.0 ± 11.1
Diabetes duration (years)	44	12.2 ± 7.5
BMI (kg/m^2)	44	36.9 ± 7.3
Systolic blood pressure (mmHg)	44	119 ± 12
Diastolic blood pressure (mmHg)	44	72 ± 10
HbA1c (%) *	42	9.2 ± 2.4
GFR (ml/min)	44	159 ± 58
ACR (mg/g)	44	18 (9-48)
RAS use (%)	44	19 (43.2%)
Mean glomerular volume (10^6 μm^3)	38	2.55 ± 1.06
Glomerular basement membrane width (nm)	41	457 ± 103
Mesangial fractional volume per glomerulus (%)	41	0.23 ± 0.07
Cortical interstitial fractional volume (%)	35	0.18 ± 0.06
Glomerular filtration surface density ($\mu m^2/\mu m^3$)	41	0.09 ± 0.02
Foot process width (nm)	39	491 (422-572)
Glomerular podocyte fractional volume (%)	41	0.18 ± 0.03
Podocyte number density per glomerulus (10^6 μm^3)	41	157 ± 98
Fenestrated endothelium (%)	39	47.4 ± 16.1

Values are means ± standard deviation or median (interquartile range).
Abbreviations: ACR = albumin:creatinine ratio; BMI = body mass index; GBM = glomerular basement membrane; GFR = glomerular filtration rate; RAS = renin angiotensin system blockers.

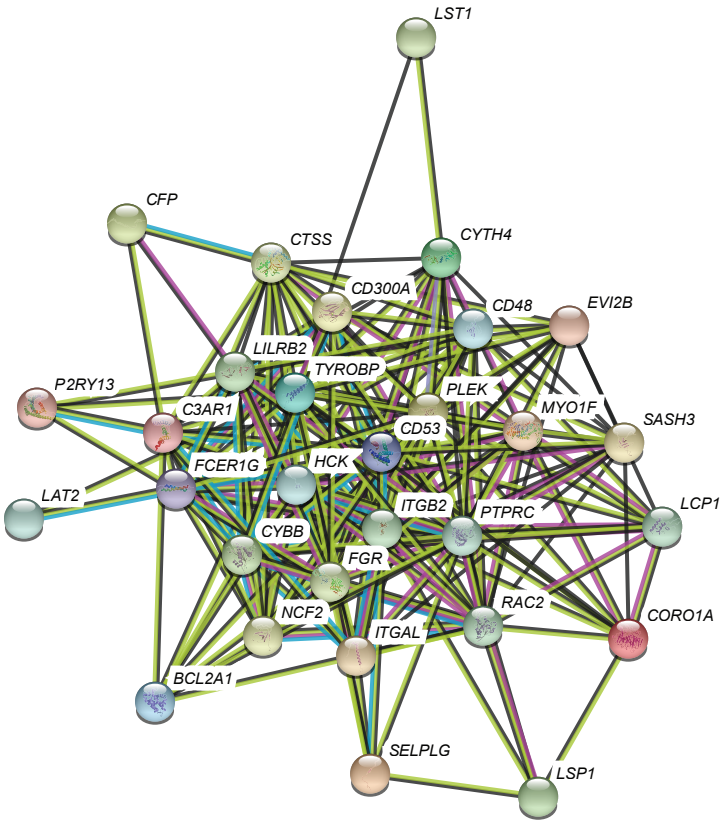
Supplemental Figure S1: Individual time-course plots of measured glomerular filtration rate (GFR) for study participants by time from kidney biopsy A) where GFR peak was within 2 years of kidney biopsy and B) where GFR peak was greater than 2 years after kidney biopsy



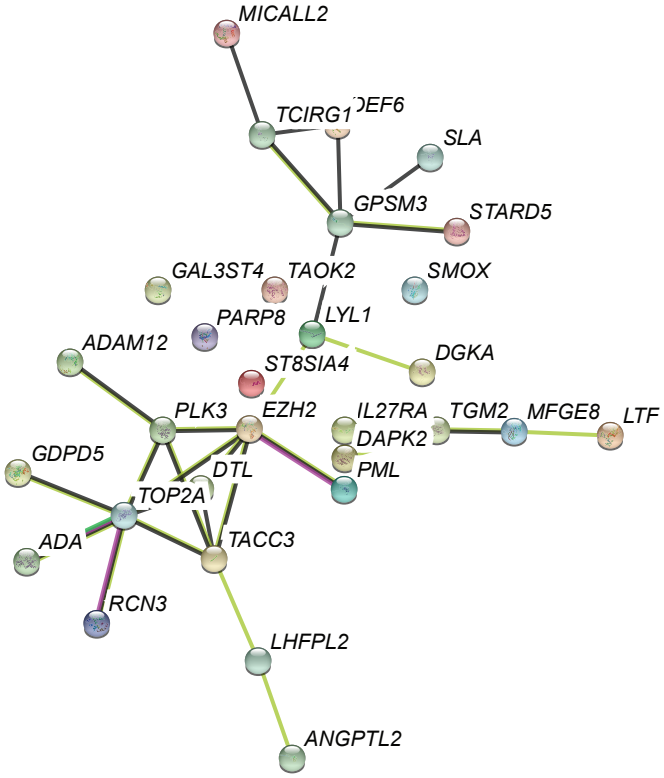


Supplemental Figure S2: Top 30 interconnected genes in HF associated modules

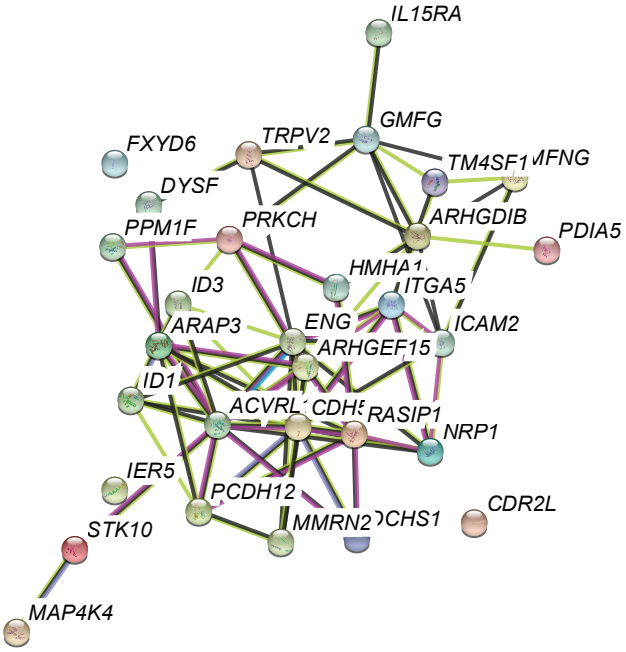
A. Salmon module

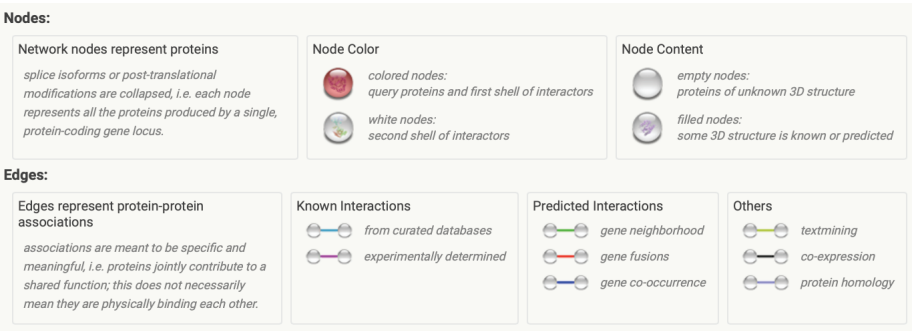


B. Midnight Blue module

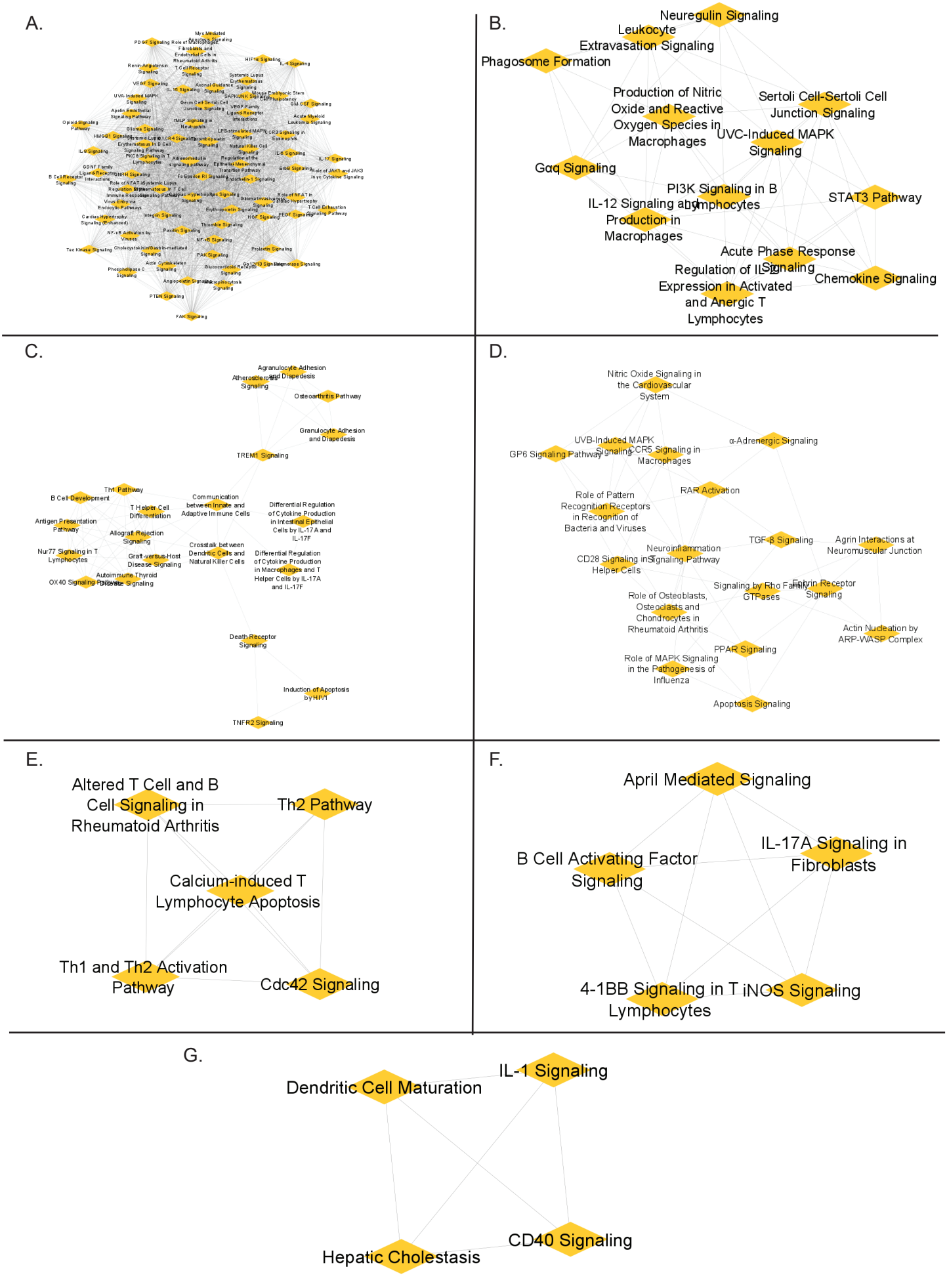


C. Red module

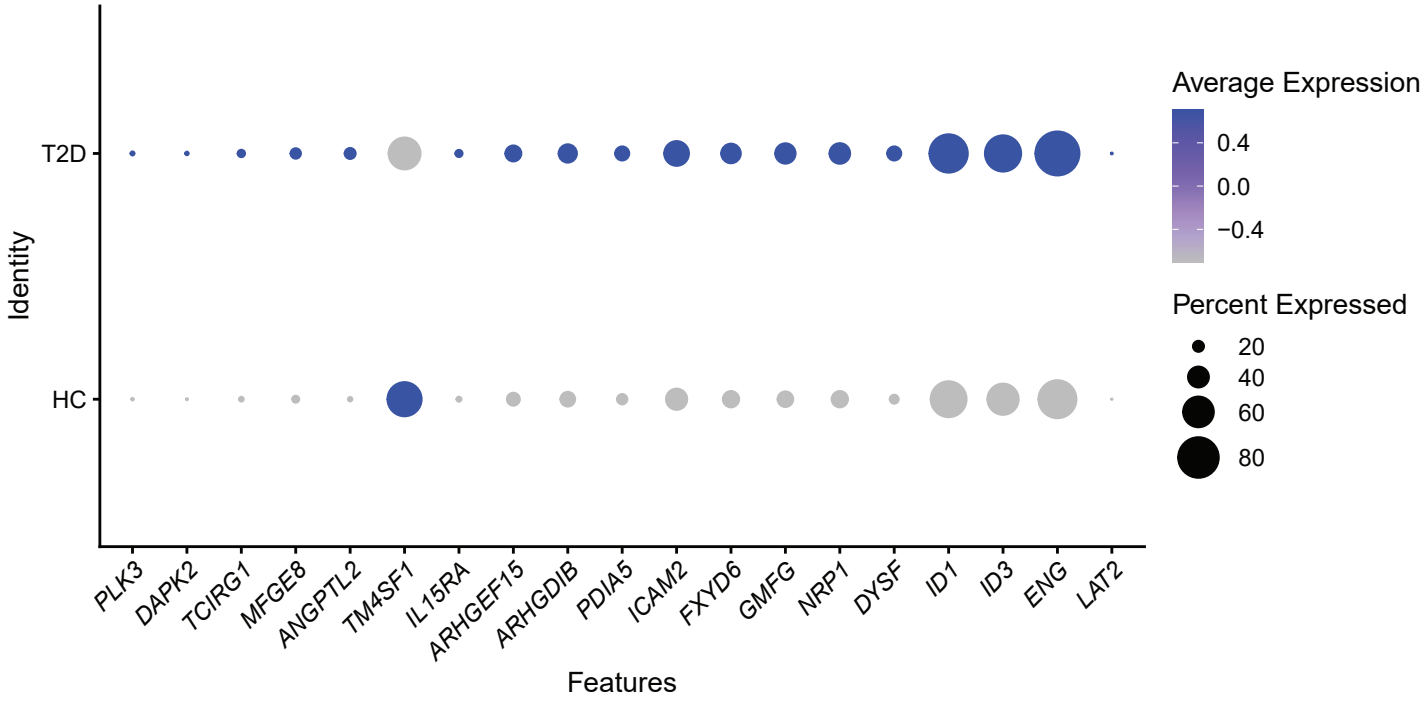




Supplemental Figure S3: Hyperfiltration gene networks and pathways using cytoscape visualization



Supplemental Figure S4: Hub genes in youth onset T2D (n=6) and healthy controls (n=6).
A dot plot showing significantly enriched hubgenes selected from the 3 hyperfiltration modules in T2D endothelial cells (T2D) compared to endothelial cell in healthy controls (HC). The dot size represents the percentage of cells expressing the gene in the respective clusters and the color represent the intensity of the expression level from grey(low) to blue (high)



Supplemental Figure S5. NicheNet predicted intracellular targets of endothelial cell activated ligands in crosstalk with mesangial cells