

SUPPLEMENTAL MATERIAL

The aging immune system in acute ischemic stroke: A transcriptomic analysis

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Supplemental Methods

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Study Participants

Patients presenting with the following criteria were excluded from the study: infection (active or in the preceding 14 days of stroke diagnosis), leukemia, lymphoma, or immunosuppressive therapy. In Cohort 1, 3.9% of patients underwent thrombolysis, and in Cohort 2, 10.6% of patients underwent thrombolysis. Characteristics of Cohort 1 were used to establish age tertile groupings in Cohort 2.⁴⁴ Comparisons were made to age-associated genes from two non-stroke aging gene set sources, described further in Methods.

Data Processing

Data processing was completed using Partek Genomics Suite (v7.0, St. Louis, MO)¹⁸ and *R* software version 3.6.3.¹⁹ Raw CEL file data were normalized by Robust Multichip Averaging (RMA) and Affymetrix probe sets summarized to the gene level. Analysis of variance (ANOVA) by age was used to select for the probe set with the lowest *P* value of significance where multiple transcripts were found for one gene annotation. Probe sets were annotated to their corresponding Entrez Gene ID and filtered to annotated transcripts present on both the Affymetrix HTA 2.0 and Human Genome U133 Plus 2.0 arrays. Unsupervised clustering in the form of multi-dimensional scaling was used to inspect data variation by cofactors,²⁰ including but not limited to hypertension, diabetes mellitus, hyperlipidemia, and smoking history; sex and study batch were identified to be included in subsequent modeling. Z-score normalization was used to visualize gene expression in both cohorts.

Graphical Abstract was created with BioRender.com.

Supplemental Figure

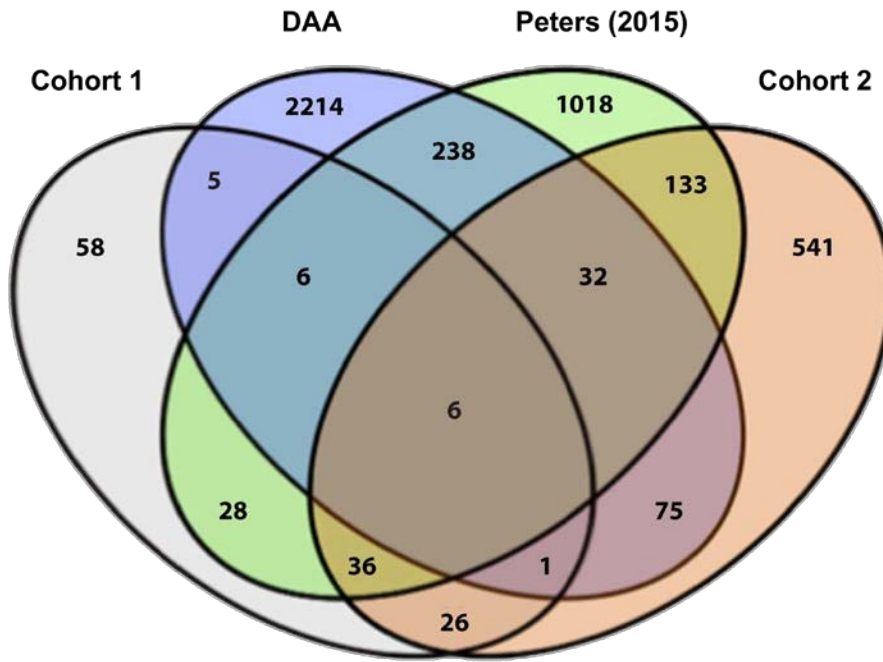


Figure I. Venn diagram comparing age-associated genes in stroke cohorts and other aging studies.

Age-associated genes from ischemic stroke Cohort 1 (grey, $n = 94$) and Cohort 2 (orange, $n = 79$) were compared to age-associated genes in non-stroke sources from the DAA study (purple) and the Peters (2015) meta-analysis (green) using Fisher's exact test ($P < 0.001$).

Table I. Differentially expressed genes with age in patients with ischemic stroke from Cohort 1**A** Genes that decrease expression with age

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
NT5E	5'-nucleotidase ecto	2.44 x 10 ⁻⁸	-0.55
CCR6	C-C motif chemokine receptor 6	2.04 x 10 ⁻⁷	-0.52
P2RX5	purinergic receptor P2X 5	2.15 x 10 ⁻⁶	-0.48
USP6NL	USP6 N-terminal like	2.34 x 10 ⁻⁶	-0.48
PTPRK	protein tyrosine phosphatase, receptor type K	2.37 x 10 ⁻⁶	-0.48
CR2	complement C3d receptor 2	2.75 x 10 ⁻⁶	-0.47
BTLA	B and T lymphocyte associated	3.66 x 10 ⁻⁶	-0.47
RASGRP3	RAS guanyl releasing protein 3	3.83 x 10 ⁻⁶	-0.47
NIBAN3	niban apoptosis regulator 3	4.49 x 10 ⁻⁶	-0.47
BANK1	B cell scaffold protein with ankyrin repeats 1	6.27 x 10 ⁻⁶	-0.46
MGAT5	alpha-1,6-mannosylglycoprotein 6-beta-N-acetylglucosaminyltransferase	7.32 x 10 ⁻⁶	-0.46
STRBP	spermatid perinuclear RNA binding protein	7.96 x 10 ⁻⁶	-0.45
NBEA	neurobeachin	8.38 x 10 ⁻⁶	-0.45
BLNK	B cell linker	1.23 x 10 ⁻⁵	-0.45
RAB30	RAB30, member RAS oncogene family	1.96 x 10 ⁻⁵	-0.44
COBLL1	cordons-bleu WH2 repeat protein like 1	2.02 x 10 ⁻⁵	-0.44
RALGPS2	Ral GEF with PH domain and SH3 binding motif 2	3.21 x 10 ⁻⁵	-0.43
CD79B	CD79b molecule	3.29 x 10 ⁻⁵	-0.43
FCRL1	Fc receptor like 1	3.67 x 10 ⁻⁵	-0.42
KLHL14	kelch like family member 14	3.67 x 10 ⁻⁵	-0.42
CDCA7L	cell division cycle associated 7 like	4.39 x 10 ⁻⁵	-0.42
RPL22	ribosomal protein L22	4.65 x 10 ⁻⁵	-0.42
SLC9A7	solute carrier family 9 member A7	4.95 x 10 ⁻⁵	-0.42
KAT2A	lysine acetyltransferase 2A	5.25 x 10 ⁻⁵	-0.42
OSBPL10	oxysterol binding protein like 10	5.52 x 10 ⁻⁵	-0.41
PLEKHG1	pleckstrin homology and RhoGEF domain containing G1	5.54 x 10 ⁻⁵	-0.41
FCRLA	Fc receptor like A	7.05 x 10 ⁻⁵	-0.41
FCRL2	Fc receptor like 2	7.17 x 10 ⁻⁵	-0.41
QRSL1	glutaminyl-tRNA amidotransferase subunit QRSL1	7.28 x 10 ⁻⁵	-0.41
SPRY1	sprouty RTK signaling antagonist 1	7.46 x 10 ⁻⁵	-0.41
ATF7IP2	activating transcription factor 7 interacting protein 2	8.74 x 10 ⁻⁵	-0.40
CXCR5	C-X-C motif chemokine receptor 5	9.97 x 10 ⁻⁵	-0.40
B3GALT2	beta-1,3-galactosyltransferase 2	1.02 x 10 ⁻⁴	-0.40

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
PAX5	paired box 5	1.12 x 10 ⁻⁴	-0.40
SPIB	Spi-B transcription factor	1.14 x 10 ⁻⁴	-0.40
TPD52	tumor protein D52	1.28 x 10 ⁻⁴	-0.40
ABLIM1	actin binding LIM protein 1	1.32 x 10 ⁻⁴	-0.39
KHDRBS2	KH RNA binding domain containing, signal transduction associated 2	1.42 x 10 ⁻⁴	-0.39
ID3	inhibitor of DNA binding 3, HLH protein	1.48 x 10 ⁻⁴	-0.39
SESN1	sestrin 1	1.54 x 10 ⁻⁴	-0.39
CCR7	C-C motif chemokine receptor 7	1.62 x 10 ⁻⁴	-0.39
ADAM28	ADAM metallopeptidase domain 28	1.66 x 10 ⁻⁴	-0.39
LDHB	lactate dehydrogenase B	1.71 x 10 ⁻⁴	-0.39
AGMAT	agmatinase	1.81 x 10 ⁻⁴	-0.39
NELL2	neural EGFL like 2	1.81 x 10 ⁻⁴	-0.39
FCER2	Fc fragment of IgE receptor II	1.84 x 10 ⁻⁴	-0.39
LEF1-AS1	LEF1 antisense RNA 1	1.86 x 10 ⁻⁴	-0.39
CD27	CD27 molecule	1.87 x 10 ⁻⁴	-0.39
GPR183	G protein-coupled receptor 183	1.93 x 10 ⁻⁴	-0.39
BCL7A	BAF chromatin remodeling complex subunit BCL7A	1.97 x 10 ⁻⁴	-0.39
CAMK4	calcium/calmodulin dependent protein kinase IV	2.45 x 10 ⁻⁴	-0.38
IFT57	intraflagellar transport 57	2.56 x 10 ⁻⁴	-0.38
TCL6	T cell leukemia/lymphoma 6	2.70 x 10 ⁻⁴	-0.38
BCL11A	BAF chromatin remodeling complex subunit BCL11A	2.76 x 10 ⁻⁴	-0.38
SEL1L3	SEL1L family member 3	2.91 x 10 ⁻⁴	-0.38
PIK3C2B	phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 beta	3.18 x 10 ⁻⁴	-0.37
VPREB3	V-set pre-B cell surrogate light chain 3	3.19 x 10 ⁻⁴	-0.37
POU2AF1	POU class 2 associating factor 1	3.34 x 10 ⁻⁴	-0.37
ITPR1	inositol 1,4,5-trisphosphate receptor type 1	3.41 x 10 ⁻⁴	-0.37
SHISAL2A	shisa like 2A	3.43 x 10 ⁻⁴	-0.37
ZCCHC7	zinc finger CCHC-type containing 7	3.70 x 10 ⁻⁴	-0.37
TMEM156	transmembrane protein 156	3.98 x 10 ⁻⁴	-0.37
EPHA4	EPH receptor A4	4.14 x 10 ⁻⁴	-0.37
CMSS1	cms1 ribosomal small subunit homolog	4.32 x 10 ⁻⁴	-0.37
TMEM204	transmembrane protein 204	4.95 x 10 ⁻⁴	-0.36
PLPP5	phospholipid phosphatase 5	5.05 x 10 ⁻⁴	-0.36
IGHM	immunoglobulin heavy constant mu	5.17 x 10 ⁻⁴	-0.36
KIF5C	kinesin family member 5C	5.18 x 10 ⁻⁴	-0.36
LRRN3	leucine rich repeat neuronal 3	8.40 x 10 ⁻⁸	-0.53
COL19A1	collagen type XIX alpha 1 chain	1.88 x 10 ⁻⁶	-0.48
AFF3	AF4/FMR2 family member 3	2.66 x 10 ⁻⁶	-0.47

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
LINC00926	long intergenic non-protein coding RNA 926	5.77 x 10 ⁻⁶	-0.46
CCDC50	coiled-coil domain containing 50	7.61 x 10 ⁻⁶	-0.46
HLA-DOA	major histocompatibility complex, class II, DO alpha	7.75 x 10 ⁻⁶	-0.45
BLK	BLK proto-oncogene, Src family tyrosine kinase	7.94 x 10 ⁻⁶	-0.45
PAWR	pro-apoptotic WT1 regulator	8.36 x 10 ⁻⁶	-0.45
MS4A1	membrane spanning 4-domains A1	1.14 x 10 ⁻⁵	-0.45
LINC01857	long intergenic non-protein coding RNA 1857	1.22 x 10 ⁻⁵	-0.45
E2F5	E2F transcription factor 5	1.24 x 10 ⁻⁵	-0.45
C1orf220	chromosome 1 open reading frame 220 (putative)	1.30 x 10 ⁻⁵	-0.44
KCNH8	potassium voltage-gated channel subfamily H member 8	1.38 x 10 ⁻⁵	-0.44
UGT8	UDP glycosyltransferase 8	1.44 x 10 ⁻⁵	-0.44
ZNF382	zinc finger protein 382	4.13 x 10 ⁻⁵	-0.42
NBEAP1	neurobeachin pseudogene 1	4.51 x 10 ⁻⁵	-0.42
CD72	CD72 molecule	5.21 x 10 ⁻⁵	-0.42
ADK	adenosine kinase	5.43 x 10 ⁻⁵	-0.41
IL23R	interleukin 23 receptor	5.51 x 10 ⁻⁵	-0.41
ABCB4	ATP binding cassette subfamily B member 4	6.02 x 10 ⁻⁵	-0.41
UBE2D2	ubiquitin conjugating enzyme E2 D2	6.37 x 10 ⁻⁵	-0.41
GRAPL	GRB2 related adaptor protein like	6.51 x 10 ⁻⁵	-0.41
HLA-DOB	major histocompatibility complex, class II, DO beta	6.70 x 10 ⁻⁵	-0.41
CD22	CD22 molecule	7.70 x 10 ⁻⁵	-0.41
EBF1	EBF transcription factor 1	7.75 x 10 ⁻⁵	-0.41
ZNF542P	zinc finger protein 542, pseudogene	8.35 x 10 ⁻⁵	-0.41
STAP1	signal transducing adaptor family member 1	9.45 x 10 ⁻⁵	-0.40
ZIK1	zinc finger protein interacting with K protein 1	9.95 x 10 ⁻⁵	-0.40
SLC4A10	solute carrier family 4 member 10	1.04 x 10 ⁻⁴	-0.40
C11orf1	chromosome 11 open reading frame 1	1.10 x 10 ⁻⁴	-0.40
C12orf42	chromosome 12 open reading frame 42	1.13 x 10 ⁻⁴	-0.40
LOC283194	uncharacterized LOC283194	1.13 x 10 ⁻⁴	-0.40
CNST	consortin, connexin sorting protein	1.18 x 10 ⁻⁴	-0.40
MAP9	microtubule associated protein 9	1.30 x 10 ⁻⁴	-0.40
LOC101928140	uncharacterized LOC101928140	1.31 x 10 ⁻⁴	-0.39
TSPAN13	tetraspanin 13	1.35 x 10 ⁻⁴	-0.39
TEX9	testis expressed 9	1.41 x 10 ⁻⁴	-0.39
SYPL1	synaptophysin like 1	1.46 x 10 ⁻⁴	-0.39
TAF4B	TATA-box binding protein associated factor 4b	1.51 x 10 ⁻⁴	-0.39
LINC00954	long intergenic non-protein coding RNA 954	1.62 x 10 ⁻⁴	-0.39
EBLN3P	endogenous Bornavirus-like nucleoprotein 3, pseudogene	1.64 x 10 ⁻⁴	-0.39

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
LINC00667	long intergenic non-protein coding RNA 667	1.64 x 10 ⁻⁴	-0.39
CHI3L2	chitinase 3 like 2	1.70 x 10 ⁻⁴	-0.39
PDE7A	phosphodiesterase 7A	1.77 x 10 ⁻⁴	-0.39
CD79A	CD79a molecule	2.12 x 10 ⁻⁴	-0.38
RIMKLB	ribosomal modification protein rimK like family member B	2.35 x 10 ⁻⁴	-0.38
SNHG8	small nucleolar RNA host gene 8	2.53 x 10 ⁻⁴	-0.38
ZNF518B	zinc finger protein 518B	2.57 x 10 ⁻⁴	-0.38
PM20D2	peptidase M20 domain containing 2	2.59 x 10 ⁻⁴	-0.38
NOG	noggin	2.92 x 10 ⁻⁴	-0.38
DPH5	diphthamide biosynthesis 5	3.01 x 10 ⁻⁴	-0.37
LTB	lymphotoxin beta	3.02 x 10 ⁻⁴	-0.37
YME1L1	YME1 like 1 ATPase	3.06 x 10 ⁻⁴	-0.37
DNAJC15	DnaJ heat shock protein family (Hsp40) member C15	3.24 x 10 ⁻⁴	-0.37
DUSP16	dual specificity phosphatase 16	3.28 x 10 ⁻⁴	-0.37
RPL18	ribosomal protein L18	3.31 x 10 ⁻⁴	-0.37
SAV1	salvador family WW domain containing protein 1	3.35 x 10 ⁻⁴	-0.37
ZDBF2	zinc finger DBF-type containing 2	3.43 x 10 ⁻⁴	-0.37
SIPA1L3	signal induced proliferation associated 1 like 3	3.52 x 10 ⁻⁴	-0.37
ZSCAN23	zinc finger and SCAN domain containing 23	3.61 x 10 ⁻⁴	-0.37
ZNF107	zinc finger protein 107	3.88 x 10 ⁻⁴	-0.37
AGPAT5	1-acylglycerol-3-phosphate O-acyltransferase 5	3.97 x 10 ⁻⁴	-0.37
CNKSR2	connector enhancer of kinase suppressor of Ras 2	4.05 x 10 ⁻⁴	-0.37
OCIAD2	OCIA domain containing 2	4.15 x 10 ⁻⁴	-0.37
RPS12	ribosomal protein S12	4.32 x 10 ⁻⁴	-0.37
BIRC3	baculoviral IAP repeat containing 3	4.48 x 10 ⁻⁴	-0.36
RAD54B	RAD54 homolog B	4.71 x 10 ⁻⁴	-0.36
CHMP7	charged multivesicular body protein 7	4.74 x 10 ⁻⁴	-0.36
CCNB1IP1	cyclin B1 interacting protein 1	4.92 x 10 ⁻⁴	-0.36

B Genes that increase expression with age

Gene Symbol	Gene Name	P value (FDR < 0.05)	r (partial correlation coefficient)
CD96	CD96 molecule	1.94 x 10 ⁻⁵	0.44
PDLIM5	PDZ and LIM domain 5	4.74 x 10 ⁻⁴	0.36
RGS3	regulator of G protein signaling 3	3.71 x 10 ⁻⁵	0.42
CYYR1	cysteine and tyrosine rich 1	6.54 x 10 ⁻⁵	0.41
NUAK1	NUAK family kinase 1	6.63 x 10 ⁻⁵	0.41
BFSP1	beaded filament structural protein 1	1.18 x 10 ⁻⁴	0.40
SYNE1	spectrin repeat containing nuclear envelope protein 1	1.29 x 10 ⁻⁴	0.40
SPON2	spondin 2	1.45 x 10 ⁻⁴	0.39
HLA-F-AS1	HLA-F antisense RNA 1	1.59 x 10 ⁻⁴	0.39
FLJ40288	uncharacterized FLJ40288	1.98 x 10 ⁻⁴	0.39
PRR5L	proline rich 5 like	2.28 x 10 ⁻⁴	0.38
TCF7L2	transcription factor 7 like 2	2.46 x 10 ⁻⁴	0.38
TTC22	tetratricopeptide repeat domain 22	2.48 x 10 ⁻⁴	0.38
CMKLR1	chemerin chemokine-like receptor 1	2.49 x 10 ⁻⁴	0.38
ADAMTS1	ADAM metalloproteinase with thrombospondin type 1 motif 1	2.60 x 10 ⁻⁴	0.38
OR1D5	olfactory receptor family 1 subfamily D member 5	2.61 x 10 ⁻⁴	0.38
MSMB	microseminoprotein beta	2.74 x 10 ⁻⁴	0.38
NANOG	Nanog homeobox	2.95 x 10 ⁻⁴	0.38
METTL7B	methyltransferase like 7B	3.15 x 10 ⁻⁴	0.37
TBX21	T-box 21	3.39 x 10 ⁻⁴	0.37
INPP1	inositol polyphosphate-1-phosphatase	3.45 x 10 ⁻⁴	0.37
ME3	malic enzyme 3	3.53 x 10 ⁻⁴	0.37
ADGRG1	adhesion G protein-coupled receptor G1	3.79 x 10 ⁻⁴	0.37
E2F8	E2F transcription factor 8	4.13 x 10 ⁻⁴	0.37
PCDHGB7	protocadherin gamma subfamily B, 7	4.38 x 10 ⁻⁴	0.37
LOC339874	uncharacterized LOC339874	4.39 x 10 ⁻⁴	0.37
HMOX1	heme oxygenase 1	4.50 x 10 ⁻⁴	0.36
ERBB2	erb-b2 receptor tyrosine kinase 2	4.73 x 10 ⁻⁴	0.36
EFNA5	ephrin A5	5.13 x 10 ⁻⁴	0.36

Table II. Differentially expressed genes with age in patients with ischemic stroke from Cohort 2**A** Genes that decrease expression with age

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
NBEA	neurobeachin	3.86 x 10 ⁻⁷	-0.58
CXCR5	C-X-C motif chemokine receptor 5	4.62 x 10 ⁻⁷	-0.57
SEL1L3	SEL1L family member 3	4.75 x 10 ⁻⁷	-0.57
LINC00494	long intergenic non-protein coding RNA 494	6.09 x 10 ⁻⁷	-0.57
OSBPL10	oxysterol binding protein like 10	1.08 x 10 ⁻⁶	-0.56
NT5E	5'-nucleotidase ecto	1.46 x 10 ⁻⁶	-0.55
FAM120C	family with sequence similarity 120C	2.01 x 10 ⁻⁶	-0.55
CCR6	C-C motif chemokine receptor 6	2.27 x 10 ⁻⁶	-0.55
LRPPRC	leucine rich pentatricopeptide repeat containing	2.79 x 10 ⁻⁶	-0.54
IGHM	immunoglobulin heavy constant mu	3.04 x 10 ⁻⁶	-0.54
CR2	complement C3d receptor 2	3.22 x 10 ⁻⁶	-0.54
FCRLA	Fc receptor like A	3.99 x 10 ⁻⁶	-0.53
RALGPS2	Ral GEF with PH domain and SH3 binding motif 2	4.09 x 10 ⁻⁶	-0.53
MTOR	mechanistic target of rapamycin kinase	4.83 x 10 ⁻⁶	-0.53
P2RX5	purinergic receptor P2X 5	5.31 x 10 ⁻⁶	-0.53
BLNK	B cell linker	5.61 x 10 ⁻⁶	-0.53
BANK1	B cell scaffold protein with ankyrin repeats 1	5.67 x 10 ⁻⁶	-0.53
SFXN2	sideroflexin 2	6.78 x 10 ⁻⁶	-0.52
RAB30	RAB30, member RAS oncogene family	7.05 x 10 ⁻⁶	-0.52
KIF5C	kinesin family member 5C	8.44 x 10 ⁻⁶	-0.52
PNOC	prepronociceptin	1.02 x 10 ⁻⁵	-0.51
DPF3	double PHD fingers 3	1.05 x 10 ⁻⁵	-0.51
TPD52	tumor protein D52	1.40 x 10 ⁻⁵	-0.51
GSPT2	G1 to S phase transition 2	1.47 x 10 ⁻⁵	-0.51
TWINK	twinkle mtDNA helicase	1.50 x 10 ⁻⁵	-0.51
QRSL1	glutaminyl-tRNA amidotransferase subunit QRSL1	1.65 x 10 ⁻⁵	-0.50
CDCA7L	cell division cycle associated 7 like	1.70 x 10 ⁻⁵	-0.50
TNFRSF13C	TNF receptor superfamily member 13C	1.76 x 10 ⁻⁵	-0.50
ZFR2	zinc finger RNA binding protein 2	1.79 x 10 ⁻⁵	-0.50
EPHA4	EPH receptor A4	1.80 x 10 ⁻⁵	-0.50
RORC	RAR related orphan receptor C	1.94 x 10 ⁻⁵	-0.50
PIK3C2B	phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 beta	2.01 x 10 ⁻⁵	-0.50
MICAL3	microtubule associated monooxygenase, calponin and LIM domain containing 3	2.12 x 10 ⁻⁵	-0.50

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
AGMAT	agmatinase	2.18 x 10 ⁻⁵	-0.50
POU2AF1	POU class 2 associating factor 1	2.23 x 10 ⁻⁵	-0.50
POLR1C	RNA polymerase I and III subunit C	2.24 x 10 ⁻⁵	-0.50
TCTN3	tectonic family member 3	2.25 x 10 ⁻⁵	-0.50
CD79B	CD79b molecule	2.31 x 10 ⁻⁵	-0.50
ZBTB24	zinc finger and BTB domain containing 24	2.34 x 10 ⁻⁵	-0.50
METTL8	methyltransferase like 8	2.72 x 10 ⁻⁵	-0.49
IL7R	interleukin 7 receptor	2.79 x 10 ⁻⁵	-0.49
FCRL2	Fc receptor like 2	2.87 x 10 ⁻⁵	-0.49
PTPRK	protein tyrosine phosphatase, receptor type K	2.87 x 10 ⁻⁵	-0.49
PARM1	prostate androgen-regulated mucin-like protein 1	2.87 x 10 ⁻⁵	-0.49
FOXP1	forkhead box P1	2.99 x 10 ⁻⁵	-0.49
MAP3K9	mitogen-activated protein kinase kinase kinase 9	3.08 x 10 ⁻⁵	-0.49
LARGE2	LARGE xylosyl- and glucuronyltransferase 2	3.37 x 10 ⁻⁵	-0.49
ZNF268	zinc finger protein 268	3.64 x 10 ⁻⁵	-0.49
KLHL14	kelch like family member 14	3.80 x 10 ⁻⁵	-0.48
SPIB	Spi-B transcription factor	3.81 x 10 ⁻⁵	-0.48
ENPP1	ectonucleotide pyrophosphatase/phosphodiesterase 1	3.87 x 10 ⁻⁵	-0.48
PAX5	paired box 5	3.90 x 10 ⁻⁵	-0.48
INO80	INO80 complex subunit	3.94 x 10 ⁻⁵	-0.48
MAP3K4	mitogen-activated protein kinase kinase kinase 4	4.01 x 10 ⁻⁵	-0.48
PLXNA1	plexin A1	4.11 x 10 ⁻⁵	-0.48
ATIC	5-aminoimidazole-4-carboxamide ribonucleotide formyltransferase /IMP cyclohydrolase	4.28 x 10 ⁻⁵	-0.48
TCP1	t-complex 1	4.35 x 10 ⁻⁵	-0.48
USP13	ubiquitin specific peptidase 13	4.39 x 10 ⁻⁵	-0.48
PITRM1	pitrilysin metallopeptidase 1	4.53 x 10 ⁻⁵	-0.48
ARL10	ADP ribosylation factor like GTPase 10	4.58 x 10 ⁻⁵	-0.48
PMEPA1	prostate transmembrane protein, androgen induced 1	4.70 x 10 ⁻⁵	-0.48
PEG10	paternally expressed 10	4.71 x 10 ⁻⁵	-0.48
CEP72	centrosomal protein 72	4.73 x 10 ⁻⁵	-0.48
LSR	lipolysis stimulated lipoprotein receptor	4.83 x 10 ⁻⁵	-0.48
GART	phosphoribosylglycinamide formyltransferase, phosphoribosylglycinamide synthetase, phosphoribosylaminoimidazole synthetase	5.24 x 10 ⁻⁵	-0.48
FBXL16	F-box and leucine rich repeat protein 16	5.42 x 10 ⁻⁵	-0.48
SDK2	sidekick cell adhesion molecule 2	5.70 x 10 ⁻⁵	-0.47
SIRPG	signal regulatory protein gamma	5.77 x 10 ⁻⁵	-0.47
IMPDH2	inosine monophosphate dehydrogenase 2	5.80 x 10 ⁻⁵	-0.47

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
SNX9	sorting nexin 9	6.04 x 10 ⁻⁵	-0.47
SMYD5	SMYD family member 5	6.05 x 10 ⁻⁵	-0.47
COBLL1	cordon-bleu WH2 repeat protein like 1	6.07 x 10 ⁻⁵	-0.47
SHMT2	serine hydroxymethyltransferase 2	6.16 x 10 ⁻⁵	-0.47
FOXO1	forkhead box O1	6.32 x 10 ⁻⁵	-0.47
KIAA0586	KIAA0586	6.34 x 10 ⁻⁵	-0.47
AKT3	AKT serine/threonine kinase 3	6.38 x 10 ⁻⁵	-0.47
TTC3	tetratricopeptide repeat domain 3	6.51 x 10 ⁻⁵	-0.47
CFL2	cofilin 2	6.62 x 10 ⁻⁵	-0.47
STRBP	spermatid perinuclear RNA binding protein	6.70 x 10 ⁻⁵	-0.47
PHF10	PHD finger protein 10	7.08 x 10 ⁻⁵	-0.47
PRAG1	PEAK1 related, kinase-activating pseudokinase 1	7.10 x 10 ⁻⁵	-0.47
FBXO10	F-box protein 10	7.14 x 10 ⁻⁵	-0.47
METAP1D	methionyl aminopeptidase type 1D, mitochondrial	7.20 x 10 ⁻⁵	-0.47
RCAN3	RCAN family member 3	7.24 x 10 ⁻⁵	-0.47
SPTBN1	spectrin beta, non-erythrocytic 1	7.34 x 10 ⁻⁵	-0.47
IARS	isoleucyl-tRNA synthetase	8.28 x 10 ⁻⁵	-0.47
ALG1	ALG1 chitobiosyldiphosphodolichol beta-mannosyltransferase	8.34 x 10 ⁻⁵	-0.47
LDLRAP1	low density lipoprotein receptor adaptor protein 1	8.62 x 10 ⁻⁵	-0.46
EPRS	glutamyl-prolyl-tRNA synthetase	9.04 x 10 ⁻⁵	-0.46
HS3ST1	heparan sulfate-glucosamine 3-sulfotransferase 1	9.31 x 10 ⁻⁵	-0.46
PDS5A	PDS5 cohesin associated factor A	9.41 x 10 ⁻⁵	-0.46
DENND5B	DENN domain containing 5B	1.06 x 10 ⁻⁴	-0.46
EIF2D	eukaryotic translation initiation factor 2D	1.06 x 10 ⁻⁴	-0.46
MYCBP2	MYC binding protein 2, E3 ubiquitin protein ligase	1.06 x 10 ⁻⁴	-0.46
PLPP5	phospholipid phosphatase 5	1.08 x 10 ⁻⁴	-0.46
TRIM47	tripartite motif containing 47	1.08 x 10 ⁻⁴	-0.46
ALDH18A1	aldehyde dehydrogenase 18 family member A1	1.10 x 10 ⁻⁴	-0.46
VPREB3	V-set pre-B cell surrogate light chain 3	1.10 x 10 ⁻⁴	-0.46
CLUAP1	clusterin associated protein 1	1.12 x 10 ⁻⁴	-0.46
CNFN	cornifelin	1.12 x 10 ⁻⁴	-0.46
TNRC6A	trinucleotide repeat containing adaptor 6A	1.14 x 10 ⁻⁴	-0.46
PEBP1	phosphatidylethanolamine binding protein 1	1.16 x 10 ⁻⁴	-0.46
SPOCK2	SPARC (osteonectin), cwcv and kazal like domains proteoglycan 2	1.16 x 10 ⁻⁴	-0.46
PPRC1	peroxisome proliferator-activated receptor gamma, coactivator-related 1	1.18 x 10 ⁻⁴	-0.46
DTX1	deltex E3 ubiquitin ligase 1	1.19 x 10 ⁻⁴	-0.46
LY9	lymphocyte antigen 9	1.20 x 10 ⁻⁴	-0.46
N4BP3	NEDD4 binding protein 3	1.24 x 10 ⁻⁴	-0.46

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
ID3	inhibitor of DNA binding 3, HLH protein	1.28 x 10 ⁻⁴	-0.45
SLAMF1	signaling lymphocytic activation molecule family member 1	1.28 x 10 ⁻⁴	-0.45
VWA8	von Willebrand factor A domain containing 8	1.28 x 10 ⁻⁴	-0.45
CAD	carbamoyl-phosphate synthetase 2, aspartate transcarbamylase, and dihydroorotase	1.33 x 10 ⁻⁴	-0.45
CD200	CD200 molecule	1.34 x 10 ⁻⁴	-0.45
ABLIM1	actin binding LIM protein 1	1.35 x 10 ⁻⁴	-0.45
IPO5	importin 5	1.35 x 10 ⁻⁴	-0.45
ITPR1	inositol 1,4,5-trisphosphate receptor type 1	1.36 x 10 ⁻⁴	-0.45
SWAP70	switching B cell complex subunit SWAP70	1.36 x 10 ⁻⁴	-0.45
NR3C2	nuclear receptor subfamily 3 group C member 2	1.39 x 10 ⁻⁴	-0.45
NOLC1	nucleolar and coiled-body phosphoprotein 1	1.40 x 10 ⁻⁴	-0.45
CHD1L	chromodomain helicase DNA binding protein 1 like	1.43 x 10 ⁻⁴	-0.45
MGAT5	alpha-1,6-mannosylglycoprotein 6-beta-N-acetylglucosaminyltransferase	1.45 x 10 ⁻⁴	-0.45
KIF3B	kinesin family member 3B	1.46 x 10 ⁻⁴	-0.45
MORC2	MORC family CW-type zinc finger 2	1.51 x 10 ⁻⁴	-0.45
ZBTB5	zinc finger and BTB domain containing 5	1.51 x 10 ⁻⁴	-0.45
OBSCN	obscurin, cytoskeletal calmodulin and titin-interacting RhoGEF	1.55 x 10 ⁻⁴	-0.45
PLEKHG1	pleckstrin homology and RhoGEF domain containing G1	1.55 x 10 ⁻⁴	-0.45
RPAP1	RNA polymerase II associated protein 1	1.58 x 10 ⁻⁴	-0.45
ZNF711	zinc finger protein 711	1.61 x 10 ⁻⁴	-0.45
TLE2	TLE family member 2, transcriptional corepressor	1.63 x 10 ⁻⁴	-0.45
HAR1A	highly accelerated region 1A	1.64 x 10 ⁻⁴	-0.45
NSMCE1	NSE1 homolog, SMC5-SMC6 complex component	1.64 x 10 ⁻⁴	-0.45
CD40	CD40 molecule	1.67 x 10 ⁻⁴	-0.45
CCT6A	chaperonin containing TCP1 subunit 6A	1.68 x 10 ⁻⁴	-0.45
MRTFB	myocardin related transcription factor B	1.68 x 10 ⁻⁴	-0.45
TRAF3IP2	TRAF3 interacting protein 2	1.68 x 10 ⁻⁴	-0.45
B4GAT1	beta-1,4-glucuronyltransferase 1	1.69 x 10 ⁻⁴	-0.45
RWDD2A	RWD domain containing 2A	1.72 x 10 ⁻⁴	-0.45
ADAM23	ADAM metallopeptidase domain 23	1.73 x 10 ⁻⁴	-0.45
MCF2L	MCF.2 cell line derived transforming sequence like	1.77 x 10 ⁻⁴	-0.45
CCR7	C-C motif chemokine receptor 7	1.82 x 10 ⁻⁴	-0.45
TRIM44	tripartite motif containing 44	1.86 x 10 ⁻⁴	-0.44
EEF2KMT	eukaryotic elongation factor 2 lysine methyltransferase	1.88 x 10 ⁻⁴	-0.44
FGF9	fibroblast growth factor 9	1.90 x 10 ⁻⁴	-0.44
CYB561A3	cytochrome b561 family member A3	1.91 x 10 ⁻⁴	-0.44
ZNF544	zinc finger protein 544	1.93 x 10 ⁻⁴	-0.44
AKAP1	A-kinase anchoring protein 1	1.96 x 10 ⁻⁴	-0.44

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
SLC2A5	solute carrier family 2 member 5	1.97 x 10 ⁻⁴	-0.44
SPTAN1	spectrin alpha, non-erythrocytic 1	1.98 x 10 ⁻⁴	-0.44
KIAA1147	KIAA1147	2.03 x 10 ⁻⁴	-0.44
TBCK	TBC1 domain containing kinase	2.06 x 10 ⁻⁴	-0.44
IPO7	importin 7	2.11 x 10 ⁻⁴	-0.44
SUSD4	sushi domain containing 4	2.13 x 10 ⁻⁴	-0.44
TMEM18	transmembrane protein 18	2.13 x 10 ⁻⁴	-0.44
GPHN	gephyrin	2.14 x 10 ⁻⁴	-0.44
GORASP2	golgi reassembly stacking protein 2	2.16 x 10 ⁻⁴	-0.44
IRAK1BP1	interleukin 1 receptor associated kinase 1 binding protein 1	2.16 x 10 ⁻⁴	-0.44
PAICS	phosphoribosylaminoimidazole carboxylase and phosphoribosylaminoimidazolesuccinocarboxamide synthase	2.25 x 10 ⁻⁴	-0.44
MEN1	menin 1	2.37 x 10 ⁻⁴	-0.44
NEDD4L	neural precursor cell expressed, developmentally down-regulated 4-like, E3 ubiquitin protein ligase	2.39 x 10 ⁻⁴	-0.44
SYBU	syntabulin	2.41 x 10 ⁻⁴	-0.44
PPP1R3E	protein phosphatase 1 regulatory subunit 3E	2.42 x 10 ⁻⁴	-0.44
ZNF777	zinc finger protein 777	2.43 x 10 ⁻⁴	-0.44
ANK1	ankyrin 1	2.44 x 10 ⁻⁴	-0.44
PLCXD1	phosphatidylinositol specific phospholipase C domain containing 1	2.50 x 10 ⁻⁴	-0.44
CAMK2N1	calcium/calmodulin dependent protein kinase II inhibitor 1	2.51 x 10 ⁻⁴	-0.44
URGCP	upregulator of cell proliferation	2.55 x 10 ⁻⁴	-0.44
ACP6	acid phosphatase 6, lysophosphatidic	2.56 x 10 ⁻⁴	-0.44
MAGEF1	MAGE family member F1	2.57 x 10 ⁻⁴	-0.44
RRS1	ribosome biogenesis regulator homolog	2.62 x 10 ⁻⁴	-0.44
IFT57	intraflagellar transport 57	2.65 x 10 ⁻⁴	-0.44
EIF2AK3	eukaryotic translation initiation factor 2 alpha kinase 3	2.72 x 10 ⁻⁴	-0.43
AFG3L2	AFG3 like matrix AAA peptidase subunit 2	2.75 x 10 ⁻⁴	-0.43
RABEP1	rabaptin, RAB GTPase binding effector protein 1	2.75 x 10 ⁻⁴	-0.43
C11orf24	chromosome 11 open reading frame 24	2.77 x 10 ⁻⁴	-0.43
CASK	calcium/calmodulin dependent serine protein kinase	2.82 x 10 ⁻⁴	-0.43
ILF3	interleukin enhancer binding factor 3	2.83 x 10 ⁻⁴	-0.43
AMN	amnion associated transmembrane protein	2.85 x 10 ⁻⁴	-0.43
RASGRF2	Ras protein specific guanine nucleotide releasing factor 2	2.85 x 10 ⁻⁴	-0.43
TCF3	transcription factor 3	2.85 x 10 ⁻⁴	-0.43
ENAM	enamelin	2.87 x 10 ⁻⁴	-0.43
FCER2	Fc fragment of IgE receptor II	2.92 x 10 ⁻⁴	-0.43
CELSR1	cadherin EGF LAG seven-pass G-type receptor 1	2.94 x 10 ⁻⁴	-0.43

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
BHLHE41	basic helix-loop-helix family member e41	2.97 x 10 ⁻⁴	-0.43
MAGED1	MAGE family member D1	2.98 x 10 ⁻⁴	-0.43
LARS	leucyl-tRNA synthetase	3.03 x 10 ⁻⁴	-0.43
EXD2	exonuclease 3'-5' domain containing 2	3.04 x 10 ⁻⁴	-0.43
KCNC4	potassium voltage-gated channel subfamily C member 4	3.08 x 10 ⁻⁴	-0.43
NIPSNAP1	nipsnap homolog 1	3.13 x 10 ⁻⁴	-0.43
OIP5-AS1	OIP5 antisense RNA 1	3.19 x 10 ⁻⁴	-0.43
TMEM231	transmembrane protein 231	3.20 x 10 ⁻⁴	-0.43
CAMK4	calcium/calmodulin dependent protein kinase IV	3.26 x 10 ⁻⁴	-0.43
FCRL1	Fc receptor like 1	3.26 x 10 ⁻⁴	-0.43
BMS1	BMS1 ribosome biogenesis factor	3.28 x 10 ⁻⁴	-0.43
DROSHA	drosha ribonuclease III	3.29 x 10 ⁻⁴	-0.43
NIBAN3	niban apoptosis regulator 3	3.33 x 10 ⁻⁴	-0.43
CPNE5	copine 5	3.37 x 10 ⁻⁴	-0.43
CBLL1	Cbl proto-oncogene like 1	3.38 x 10 ⁻⁴	-0.43
SIGMAR1	sigma non-opioid intracellular receptor 1	3.39 x 10 ⁻⁴	-0.43
CARD11	caspase recruitment domain family member 11	3.40 x 10 ⁻⁴	-0.43
RPL10A	ribosomal protein L10a	3.41 x 10 ⁻⁴	-0.43
ZFP82	ZFP82 zinc finger protein	3.42 x 10 ⁻⁴	-0.43
KLF8	Kruppel like factor 8	3.45 x 10 ⁻⁴	-0.43
PLEKHG4	pleckstrin homology and RhoGEF domain containing G4	3.47 x 10 ⁻⁴	-0.43
GOT2	glutamic-oxaloacetic transaminase 2	3.52 x 10 ⁻⁴	-0.43
DFFA	DNA fragmentation factor subunit alpha	3.56 x 10 ⁻⁴	-0.43
C17orf51	chromosome 17 open reading frame 51	3.56 x 10 ⁻⁴	-0.43
ANKS6	ankyrin repeat and sterile alpha motif domain containing 6	3.56 x 10 ⁻⁴	-0.43
B3GALT2	beta-1,3-galactosyltransferase 2	3.56 x 10 ⁻⁴	-0.43
ELL3	elongation factor for RNA polymerase II 3	3.65 x 10 ⁻⁴	-0.43
NELL2	neural EGFL like 2	3.67 x 10 ⁻⁴	-0.43
BEND4	BEN domain containing 4	3.70 x 10 ⁻⁴	-0.43
HNRNPU	heterogeneous nuclear ribonucleoprotein U	3.71 x 10 ⁻⁴	-0.43
POLH	DNA polymerase eta	3.72 x 10 ⁻⁴	-0.43
ATF7IP2	activating transcription factor 7 interacting protein 2	3.74 x 10 ⁻⁴	-0.43
ZNF101	zinc finger protein 101	3.77 x 10 ⁻⁴	-0.43
TMEM204	transmembrane protein 204	3.79 x 10 ⁻⁴	-0.43
CRTC3	CREB regulated transcription coactivator 3	3.80 x 10 ⁻⁴	-0.43
MTUS1	microtubule associated scaffold protein 1	3.84 x 10 ⁻⁴	-0.42

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
SH3BP5	SH3 domain binding protein 5	3.86 x 10 ⁻⁴	-0.42
COL4A4	collagen type IV alpha 4 chain	3.90 x 10 ⁻⁴	-0.42
POLR1B	RNA polymerase I subunit B	3.90 x 10 ⁻⁴	-0.42
WNT2B	Wnt family member 2B	3.92 x 10 ⁻⁴	-0.42
NUP43	nucleoporin 43	3.93 x 10 ⁻⁴	-0.42
ARID5B	AT-rich interaction domain 5B	4.02 x 10 ⁻⁴	-0.42
BCL7A	BAF chromatin remodeling complex subunit BCL7A	4.14 x 10 ⁻⁴	-0.42
CD44	CD44 molecule (Indian blood group)	4.17 x 10 ⁻⁴	-0.42
SGCE	sarcoglycan epsilon	4.21 x 10 ⁻⁴	-0.42
IKZF3	IKAROS family zinc finger 3	4.31 x 10 ⁻⁴	-0.42
NCL	nucleolin	4.38 x 10 ⁻⁴	-0.42
WDR34	WD repeat domain 34	4.38 x 10 ⁻⁴	-0.42
BCL11A	BAF chromatin remodeling complex subunit BCL11A	4.41 x 10 ⁻⁴	-0.42
RRP1B	ribosomal RNA processing 1B	4.41 x 10 ⁻⁴	-0.42
GPRASP1	G protein-coupled receptor associated sorting protein 1	4.44 x 10 ⁻⁴	-0.42
SYNPO	synaptopodin	4.51 x 10 ⁻⁴	-0.42
MEF2C	myocyte enhancer factor 2C	4.58 x 10 ⁻⁴	-0.42
DCAF4	DDB1 and CUL4 associated factor 4	4.59 x 10 ⁻⁴	-0.42
DSEL	dermatan sulfate epimerase like	4.61 x 10 ⁻⁴	-0.42
GUF1	GUF1 homolog, GTPase	4.79 x 10 ⁻⁴	-0.42
PUS1	pseudouridine synthase 1	4.79 x 10 ⁻⁴	-0.42
C12orf65	chromosome 12 open reading frame 65	4.80 x 10 ⁻⁴	-0.42
SNX25	sorting nexin 25	4.82 x 10 ⁻⁴	-0.42
RASGRP3	RAS guanyl releasing protein 3	4.85 x 10 ⁻⁴	-0.42
CAMTA1	calmodulin binding transcription activator 1	4.91 x 10 ⁻⁴	-0.42
TYW1	tRNA-yW synthesizing protein 1 homolog	5.00 x 10 ⁻⁴	-0.42
ELK3	ETS transcription factor ELK3	5.06 x 10 ⁻⁴	-0.42
SLC12A2	solute carrier family 12 member 2	5.08 x 10 ⁻⁴	-0.42
MOAP1	modulator of apoptosis 1	5.24 x 10 ⁻⁴	-0.42
FAM98A	family with sequence similarity 98 member A	5.25 x 10 ⁻⁴	-0.42
MATN2	matrilin 2	5.25 x 10 ⁻⁴	-0.42
PRXL2A	peroxiredoxin like 2A	5.25 x 10 ⁻⁴	-0.42
ADAM12	ADAM metallopeptidase domain 12	5.26 x 10 ⁻⁴	-0.42
UTP4	UTP4 small subunit processome component	5.29 x 10 ⁻⁴	-0.42
USP51	ubiquitin specific peptidase 51	5.36 x 10 ⁻⁴	-0.42
ELP4	elongator acetyltransferase complex subunit 4	5.38 x 10 ⁻⁴	-0.42

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
PCED1B	PC-esterase domain containing 1B	5.41 x 10 ⁻⁴	-0.41
SRP68	signal recognition particle 68	5.41 x 10 ⁻⁴	-0.41
ABCA17P	ATP binding cassette subfamily A member 17, pseudogene	5.64 x 10 ⁻⁴	-0.41
ZNF275	zinc finger protein 275	5.64 x 10 ⁻⁴	-0.41
SLC38A1	solute carrier family 38 member 1	5.66 x 10 ⁻⁴	-0.41
CYP2E1	cytochrome P450 family 2 subfamily E member 1	5.69 x 10 ⁻⁴	-0.41
PRDM4	PR/SET domain 4	5.70 x 10 ⁻⁴	-0.41
SPON1	spondin 1	5.80 x 10 ⁻⁴	-0.41
VEGFB	vascular endothelial growth factor B	5.80 x 10 ⁻⁴	-0.41
RSL1D1	ribosomal L1 domain containing 1	5.85 x 10 ⁻⁴	-0.41
TCF4	transcription factor 4	5.93 x 10 ⁻⁴	-0.41
EIF3L	eukaryotic translation initiation factor 3 subunit L	5.94 x 10 ⁻⁴	-0.41
RNGTT	RNA guanylyltransferase and 5'-phosphatase	5.95 x 10 ⁻⁴	-0.41
SLCO5A1	solute carrier organic anion transporter family member 5A1	5.95 x 10 ⁻⁴	-0.41
ECI2	enoyl-CoA delta isomerase 2	5.97 x 10 ⁻⁴	-0.41
GDF7	growth differentiation factor 7	5.97 x 10 ⁻⁴	-0.41
ZNF337	zinc finger protein 337	5.99 x 10 ⁻⁴	-0.41
TESPA1	thymocyte expressed, positive selection associated 1	6.10 x 10 ⁻⁴	-0.41
RPRD2	regulation of nuclear pre-mRNA domain containing 2	6.11 x 10 ⁻⁴	-0.41
DANCR	differentiation antagonizing non-protein coding RNA	6.14 x 10 ⁻⁴	-0.41
ALG9	ALG9 alpha-1,2-mannosyltransferase	6.41 x 10 ⁻⁴	-0.41
UTP14A	UTP14A small subunit processome component	6.42 x 10 ⁻⁴	-0.41
GATA3	GATA binding protein 3	6.44 x 10 ⁻⁴	-0.41
IKZF1	IKAROS family zinc finger 1	6.51 x 10 ⁻⁴	-0.41
ABCB8	ATP binding cassette subfamily B member 8	6.64 x 10 ⁻⁴	-0.41
AXIN2	axin 2	6.64 x 10 ⁻⁴	-0.41
BRD3OS	BRD3 opposite strand	6.84 x 10 ⁻⁴	-0.41
KAT6B	lysine acetyltransferase 6B	6.85 x 10 ⁻⁴	-0.41
PATJ	PATJ crumbs cell polarity complex component	6.86 x 10 ⁻⁴	-0.41
TTL11	tubulin tyrosine ligase like 11	6.86 x 10 ⁻⁴	-0.41
NFX1	nuclear transcription factor, X-box binding 1	6.92 x 10 ⁻⁴	-0.41
HEATR1	HEAT repeat containing 1	6.95 x 10 ⁻⁴	-0.41
LNP1	leukemia NUP98 fusion partner 1	6.96 x 10 ⁻⁴	-0.41
MDN1	midasin AAA ATPase 1	6.97 x 10 ⁻⁴	-0.41
ASNS	asparagine synthetase (glutamine-hydrolyzing)	7.00 x 10 ⁻⁴	-0.41
ANK3	ankyrin 3	7.04 x 10 ⁻⁴	-0.41

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
FBXO31	F-box protein 31	7.08 x 10 ⁻⁴	-0.41
CORO2B	coronin 2B	7.09 x 10 ⁻⁴	-0.41
PLEKHB1	pleckstrin homology domain containing B1	7.12 x 10 ⁻⁴	-0.41
DHRS4-AS1	DHRS4 antisense RNA 1	7.14 x 10 ⁻⁴	-0.41
OGFOD1	2-oxoglutarate and iron dependent oxygenase domain containing 1	7.15 x 10 ⁻⁴	-0.41
UTP25	UTP25 small subunit processor component	7.24 x 10 ⁻⁴	-0.41
NAF1	nuclear assembly factor 1 ribonucleoprotein	7.35 x 10 ⁻⁴	-0.41
PRKCA	protein kinase C alpha	7.35 x 10 ⁻⁴	-0.41
KAT14	lysine acetyltransferase 14	7.38 x 10 ⁻⁴	-0.41
IL7	interleukin 7	7.50 x 10 ⁻⁴	-0.41
RPL13	ribosomal protein L13	7.54 x 10 ⁻⁴	-0.41
USP36	ubiquitin specific peptidase 36	7.54 x 10 ⁻⁴	-0.41
SPRY1	sprouty RTK signaling antagonist 1	7.62 x 10 ⁻⁴	-0.40
POLR3B	RNA polymerase III subunit B	7.63 x 10 ⁻⁴	-0.40
ZXDB	zinc finger X-linked duplicated B	7.68 x 10 ⁻⁴	-0.40
CEP68	centrosomal protein 68	7.76 x 10 ⁻⁴	-0.40
THEM4	thioesterase superfamily member 4	7.82 x 10 ⁻⁴	-0.40
GGA2	golgi associated, gamma adaptin ear containing, ARF binding protein 2	7.94 x 10 ⁻⁴	-0.40
LDOC1	LDOC1 regulator of NFkB signaling	7.94 x 10 ⁻⁴	-0.40
AEBP1	AE binding protein 1	7.95 x 10 ⁻⁴	-0.40
CARMIL2	capping protein regulator and myosin 1 linker 2	8.00 x 10 ⁻⁴	-0.40
GRSF1	G-rich RNA sequence binding factor 1	8.04 x 10 ⁻⁴	-0.40
NVL	nuclear VCP-like	8.05 x 10 ⁻⁴	-0.40
WDR92	WD repeat domain 92	8.10 x 10 ⁻⁴	-0.40
LDHB	lactate dehydrogenase B	8.14 x 10 ⁻⁴	-0.40
SHISAL2A	shisa like 2A	8.14 x 10 ⁻⁴	-0.40
FARSB	phenylalanyl-tRNA synthetase subunit beta	8.15 x 10 ⁻⁴	-0.40
TSPYL5	TSPY like 5	8.32 x 10 ⁻⁴	-0.40
CCT3	chaperonin containing TCP1 subunit 3	8.39 x 10 ⁻⁴	-0.40
SERGEF	secretion regulating guanine nucleotide exchange factor	8.41 x 10 ⁻⁴	-0.40
DGKA	diacylglycerol kinase alpha	8.42 x 10 ⁻⁴	-0.40
MAGEE1	MAGE family member E1	8.42 x 10 ⁻⁴	-0.40
MAL	mal, T cell differentiation protein	8.45 x 10 ⁻⁴	-0.40
MID2	midline 2	8.45 x 10 ⁻⁴	-0.40
CTR9	CTR9 homolog, Paf1/RNA polymerase II complex component	8.53 x 10 ⁻⁴	-0.40
FAM160B2	family with sequence similarity 160 member B2	8.56 x 10 ⁻⁴	-0.40

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
NOB1	NIN1 (RPN12) binding protein 1 homolog	8.65 x 10 ⁻⁴	-0.40
KLHL6	kelch like family member 6	8.66 x 10 ⁻⁴	-0.40
MRM2	mitochondrial rRNA methyltransferase 2	8.68 x 10 ⁻⁴	-0.40
VSIG1	V-set and immunoglobulin domain containing 1	8.72 x 10 ⁻⁴	-0.40
YTHDC2	YTH domain containing 2	8.73 x 10 ⁻⁴	-0.40
CENPO	centromere protein O	8.79 x 10 ⁻⁴	-0.40
ST6GAL1	ST6 beta-galactoside alpha-2,6-sialyltransferase 1	8.87 x 10 ⁻⁴	-0.40
CCT7	chaperonin containing TCP1 subunit 7	9.04 x 10 ⁻⁴	-0.40
GEMIN4	gem nuclear organelle associated protein 4	9.08 x 10 ⁻⁴	-0.40
ELP2	elongator acetyltransferase complex subunit 2	9.10 x 10 ⁻⁴	-0.40
SREBF2	sterol regulatory element binding transcription factor 2	9.14 x 10 ⁻⁴	-0.40
KCTD7	potassium channel tetramerization domain containing 7	9.15 x 10 ⁻⁴	-0.40
PDIA3	protein disulfide isomerase family A member 3	9.18 x 10 ⁻⁴	-0.40
PLA1A	phospholipase A1 member A	9.19 x 10 ⁻⁴	-0.40
XPO5	exportin 5	9.24 x 10 ⁻⁴	-0.40
ZNF395	zinc finger protein 395	9.29 x 10 ⁻⁴	-0.40
HSP90B1	heat shock protein 90 beta family member 1	9.30 x 10 ⁻⁴	-0.40
ADCY3	adenylate cyclase 3	9.43 x 10 ⁻⁴	-0.40
AQP3	aquaporin 3 (Gill blood group)	9.43 x 10 ⁻⁴	-0.40
SLC18B1	solute carrier family 18 member B1	9.48 x 10 ⁻⁴	-0.40
MIPEP	mitochondrial intermediate peptidase	9.49 x 10 ⁻⁴	-0.40
CAND2	cullin associated and neddylation dissociated 2 (putative)	9.59 x 10 ⁻⁴	-0.40
KMO	kynurenine 3-monooxygenase	9.63 x 10 ⁻⁴	-0.40
RPL32	ribosomal protein L32	9.64 x 10 ⁻⁴	-0.40
C5orf63	chromosome 5 open reading frame 63	9.68 x 10 ⁻⁴	-0.40
DDHD2	DDHD domain containing 2	9.71 x 10 ⁻⁴	-0.40
LONP1	lon peptidase 1, mitochondrial	9.76 x 10 ⁻⁴	-0.40
BDH1	3-hydroxybutyrate dehydrogenase 1	9.77 x 10 ⁻⁴	-0.40
HNRNPDL	heterogeneous nuclear ribonucleoprotein D like	9.77 x 10 ⁻⁴	-0.40
ATP10A	ATPase phospholipid transporting 10A (putative)	9.82 x 10 ⁻⁴	-0.40
DIS3L	DIS3 like exosome 3'-5' exoribonuclease	9.83 x 10 ⁻⁴	-0.40
ZNF514	zinc finger protein 514	9.86 x 10 ⁻⁴	-0.40
ZFYVE9	zinc finger FYVE-type containing 9	9.89 x 10 ⁻⁴	-0.40
PLCG1	phospholipase C gamma 1	9.91 x 10 ⁻⁴	-0.40
RPL22	ribosomal protein L22	1.00 x 10 ⁻³	-0.40
NMT2	N-myristoyltransferase 2	1.00 x 10 ⁻³	-0.40

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
SLC30A4	solute carrier family 30 member 4	1.01 x 10 ⁻³	-0.40
ZNF329	zinc finger protein 329	1.01 x 10 ⁻³	-0.40
ADCK2	aarF domain containing kinase 2	1.02 x 10 ⁻³	-0.40
ERCC6L2	ERCC excision repair 6 like 2	1.02 x 10 ⁻³	-0.40
CD6	CD6 molecule	1.03 x 10 ⁻³	-0.40
PCNX2	pecanex 2	1.03 x 10 ⁻³	-0.40
ZNF783	zinc finger family member 783	1.04 x 10 ⁻³	-0.40
MOB3B	MOB kinase activator 3B	1.05 x 10 ⁻³	-0.39
PARP1	poly(ADP-ribose) polymerase 1	1.07 x 10 ⁻³	-0.39
WNT16	Wnt family member 16	1.07 x 10 ⁻³	-0.39
ZBTB20	zinc finger and BTB domain containing 20	1.07 x 10 ⁻³	-0.39
BCL2	BCL2 apoptosis regulator	1.08 x 10 ⁻³	-0.39
BTRC	beta-transducin repeat containing E3 ubiquitin protein ligase	1.08 x 10 ⁻³	-0.39
WDR78	WD repeat domain 78	1.08 x 10 ⁻³	-0.39
EEF2	eukaryotic translation elongation factor 2	1.09 x 10 ⁻³	-0.39
KCNG1	potassium voltage-gated channel modifier subfamily G member 1	1.09 x 10 ⁻³	-0.39
STMN3	stathmin 3	1.09 x 10 ⁻³	-0.39
USP6NL	USP6 N-terminal like	1.09 x 10 ⁻³	-0.39
LAMC1	laminin subunit gamma 1	1.10 x 10 ⁻³	-0.39
HSPD1	heat shock protein family D (Hsp60) member 1	1.12 x 10 ⁻³	-0.39
ATP6V0E2	ATPase H ⁺ transporting V0 subunit e2	1.13 x 10 ⁻³	-0.39
IRS1	insulin receptor substrate 1	1.13 x 10 ⁻³	-0.39
SDHAP1	succinate dehydrogenase complex flavoprotein subunit A pseudogene 1	1.14 x 10 ⁻³	-0.39
ENAH	ENAH actin regulator	1.15 x 10 ⁻³	-0.39
ITK	IL2 inducible T cell kinase	1.15 x 10 ⁻³	-0.39
LTA	lymphotoxin alpha	1.15 x 10 ⁻³	-0.39
CDC25B	cell division cycle 25B	1.17 x 10 ⁻³	-0.39
LRBA	LPS responsive beige-like anchor protein	1.17 x 10 ⁻³	-0.39
METTL16	methyltransferase like 16	1.17 x 10 ⁻³	-0.39
MTERF4	mitochondrial transcription termination factor 4	1.17 x 10 ⁻³	-0.39
TRMT1	tRNA methyltransferase 1	1.17 x 10 ⁻³	-0.39
ZNF285	zinc finger protein 285	1.17 x 10 ⁻³	-0.39
LNPEP	leucyl and cystinyl aminopeptidase	1.18 x 10 ⁻³	-0.39
TTC12	tetratricopeptide repeat domain 12	1.18 x 10 ⁻³	-0.39
TIMELESS	timeless circadian regulator	1.19 x 10 ⁻³	-0.39
ESYT2	extended synaptotagmin 2	1.19 x 10 ⁻³	-0.39

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
TCEAL3	transcription elongation factor A like 3	1.21 x 10 ⁻³	-0.39
SEH1L	SEH1 like nucleoporin	1.22 x 10 ⁻³	-0.39
USP34	ubiquitin specific peptidase 34	1.22 x 10 ⁻³	-0.39
UXS1	UDP-glucuronate decarboxylase 1	1.22 x 10 ⁻³	-0.39
ZNF532	zinc finger protein 532	1.22 x 10 ⁻³	-0.39
CLNK	cytokine dependent hematopoietic cell linker	1.23 x 10 ⁻³	-0.39
FTSJ3	FtsJ RNA 2'-O-methyltransferase 3	1.24 x 10 ⁻³	-0.39
ZNF793	zinc finger protein 793	1.24 x 10 ⁻³	-0.39
ETS1	ETS proto-oncogene 1, transcription factor	1.25 x 10 ⁻³	-0.39
DHFR2	dihydrofolate reductase 2	1.26 x 10 ⁻³	-0.39
PPM1K	protein phosphatase, Mg ²⁺ /Mn ²⁺ dependent 1K	1.26 x 10 ⁻³	-0.39
LARS2	leucyl-tRNA synthetase 2, mitochondrial	1.27 x 10 ⁻³	-0.39
MATN1-AS1	MATN1 antisense RNA 1	1.28 x 10 ⁻³	-0.39
NBAS	neuroblastoma amplified sequence	1.28 x 10 ⁻³	-0.39
PDHA1	pyruvate dehydrogenase E1 alpha 1 subunit	1.28 x 10 ⁻³	-0.39
SLC9A7	solute carrier family 9 member A7	1.29 x 10 ⁻³	-0.39
IGSF11	immunoglobulin superfamily member 11	1.29 x 10 ⁻³	-0.39
BTNL9	butyrophilin like 9	1.30 x 10 ⁻³	-0.39
SLC7A1	solute carrier family 7 member 1	1.30 x 10 ⁻³	-0.39
PIK3IP1	phosphoinositide-3-kinase interacting protein 1	1.31 x 10 ⁻³	-0.39
UBE2I	ubiquitin conjugating enzyme E2 I	1.31 x 10 ⁻³	-0.39
GCN1	GCN1, eIF2 alpha kinase activator homolog	1.32 x 10 ⁻³	-0.39
CD27	CD27 molecule	1.33 x 10 ⁻³	-0.39
RPS28	ribosomal protein S28	1.33 x 10 ⁻³	-0.39
RRP15	ribosomal RNA processing 15 homolog	1.33 x 10 ⁻³	-0.39
SIDT1	SID1 transmembrane family member 1	1.34 x 10 ⁻³	-0.39
SIX3	SIX homeobox 3	1.34 x 10 ⁻³	-0.39
VARS	valyl-tRNA synthetase	1.34 x 10 ⁻³	-0.39
GPR183	G protein-coupled receptor 183	1.35 x 10 ⁻³	-0.39
TMEM203	transmembrane protein 203	1.35 x 10 ⁻³	-0.39
ALMS1	ALMS1 centrosome and basal body associated protein	1.35 x 10 ⁻³	-0.39
COX20	cytochrome c oxidase assembly factor COX20	1.35 x 10 ⁻³	-0.39
ELP1	elongator complex protein 1	1.35 x 10 ⁻³	-0.39
DAB1	DAB adaptor protein 1	1.37 x 10 ⁻³	-0.39
ZNF165	zinc finger protein 165	1.38 x 10 ⁻³	-0.39
CMSS1	cms1 ribosomal small subunit homolog	1.38 x 10 ⁻³	-0.39

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
ZNF691	zinc finger protein 691	1.38 x 10 ⁻³	-0.39
MAP2	microtubule associated protein 2	1.39 x 10 ⁻³	-0.39
SLC25A23	solute carrier family 25 member 23	1.39 x 10 ⁻³	-0.39
AMIGO1	adhesion molecule with Ig like domain 1	1.40 x 10 ⁻³	-0.39
ATPAF1	ATP synthase mitochondrial F1 complex assembly factor 1	1.40 x 10 ⁻³	-0.39
DOCK9-DT	DOCK9 divergent transcript	1.40 x 10 ⁻³	-0.39
TTC9	tetratricopeptide repeat domain 9	1.42 x 10 ⁻³	-0.39
ZNF343	zinc finger protein 343	1.42 x 10 ⁻³	-0.39
BEND5	BEN domain containing 5	1.43 x 10 ⁻³	-0.39
PWP1	PWP1 homolog, endonuclein	1.43 x 10 ⁻³	-0.39
KDSR	3-ketodihydrosphingosine reductase	1.44 x 10 ⁻³	-0.38
TADA2A	transcriptional adaptor 2A	1.44 x 10 ⁻³	-0.38
TRIP10	thyroid hormone receptor interactor 10	1.44 x 10 ⁻³	-0.38
SCML4	Scm polycomb group protein like 4	1.45 x 10 ⁻³	-0.38
KAT2A	lysine acetyltransferase 2A	1.46 x 10 ⁻³	-0.38
TCL6	T cell leukemia/lymphoma 6	1.47 x 10 ⁻³	-0.38
PJKV	pejvakin	1.48 x 10 ⁻³	-0.38
ATMIN	ATM interactor	1.48 x 10 ⁻³	-0.38
ZNF416	zinc finger protein 416	1.48 x 10 ⁻³	-0.38
CYP2U1	cytochrome P450 family 2 subfamily U member 1	1.49 x 10 ⁻³	-0.38
TCL1A	T cell leukemia/lymphoma 1A	1.49 x 10 ⁻³	-0.38
PIGO	phosphatidylinositol glycan anchor biosynthesis class O	1.50 x 10 ⁻³	-0.38
PCM1	pericentriolar material 1	1.51 x 10 ⁻³	-0.38
TUB	tubby bipartite transcription factor	1.51 x 10 ⁻³	-0.38
GJB6	gap junction protein beta 6	1.52 x 10 ⁻³	-0.38
SART3	spliceosome associated factor 3, U4/U6 recycling protein	1.53 x 10 ⁻³	-0.38
MORC4	MORC family CW-type zinc finger 4	1.54 x 10 ⁻³	-0.38
TRMT44	tRNA methyltransferase 44 homolog	1.54 x 10 ⁻³	-0.38
POLR3A	RNA polymerase III subunit A	1.56 x 10 ⁻³	-0.38
CRIP3	cysteine rich protein 3	1.57 x 10 ⁻³	-0.38
SLC6A16	solute carrier family 6 member 16	1.57 x 10 ⁻³	-0.38
FIZ1	FLT3 interacting zinc finger 1	1.58 x 10 ⁻³	-0.38
NUMA1	nuclear mitotic apparatus protein 1	1.58 x 10 ⁻³	-0.38
UBIAD1	UbiA prenyltransferase domain containing 1	1.58 x 10 ⁻³	-0.38
ARHGAP5	Rho GTPase activating protein 5	1.60 x 10 ⁻³	-0.38
HNRNPA3	heterogeneous nuclear ribonucleoprotein A3	1.60 x 10 ⁻³	-0.38

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
LINC01342	long intergenic non-protein coding RNA 1342	1.60 x 10 ⁻³	-0.38
CTPS2	CTP synthase 2	1.61 x 10 ⁻³	-0.38
DNAAF5	dynein axonemal assembly factor 5	1.61 x 10 ⁻³	-0.38
HACD3	3-hydroxyacyl-CoA dehydratase 3	1.61 x 10 ⁻³	-0.38
UQCC1	ubiquinol-cytochrome c reductase complex assembly factor 1	1.63 x 10 ⁻³	-0.38
DNMT1	DNA methyltransferase 1	1.65 x 10 ⁻³	-0.38
PAQR8	progesterin and adipoQ receptor family member 8	1.65 x 10 ⁻³	-0.38
EIF5B	eukaryotic translation initiation factor 5B	1.66 x 10 ⁻³	-0.38
NCAPG2	non-SMC condensin II complex subunit G2	1.66 x 10 ⁻³	-0.38
CD28	CD28 molecule	1.67 x 10 ⁻³	-0.38
SEC31A	SEC31 homolog A, COPII coat complex component	1.67 x 10 ⁻³	-0.38
TMED10	transmembrane p24 trafficking protein 10	1.67 x 10 ⁻³	-0.38
SHISA8	shisa family member 8	1.69 x 10 ⁻³	-0.38
ATP1A1-AS1	ATP1A1 antisense RNA 1	1.70 x 10 ⁻³	-0.38
FADS3	fatty acid desaturase 3	1.70 x 10 ⁻³	-0.38
LRCH1	leucine rich repeats and calponin homology domain containing 1	1.70 x 10 ⁻³	-0.38
DYRK2	dual specificity tyrosine phosphorylation regulated kinase 2	1.71 x 10 ⁻³	-0.38
NELFCD	negative elongation factor complex member C/D	1.71 x 10 ⁻³	-0.38
LDAH	lipid droplet associated hydrolase	1.72 x 10 ⁻³	-0.38
NHP2	NHP2 ribonucleoprotein	1.73 x 10 ⁻³	-0.38
ARMH3	armadillo-like helical domain containing 3	1.75 x 10 ⁻³	-0.38
LEF1-AS1	LEF1 antisense RNA 1	1.76 x 10 ⁻³	-0.38
CD83	CD83 molecule	1.76 x 10 ⁻³	-0.38
NUP133	nucleoporin 133	1.76 x 10 ⁻³	-0.38
TCF12	transcription factor 12	1.76 x 10 ⁻³	-0.38
SEMA6A	semaphorin 6A	1.78 x 10 ⁻³	-0.38
ABHD14B	abhydrolase domain containing 14B	1.79 x 10 ⁻³	-0.38
BTLA	B and T lymphocyte associated	1.80 x 10 ⁻³	-0.38
C12orf66	chromosome 12 open reading frame 66	1.81 x 10 ⁻³	-0.38
RBM26-AS1	RBM26 antisense RNA 1	1.81 x 10 ⁻³	-0.38
SEMA4F	semaphorin 4F	1.81 x 10 ⁻³	-0.38
FAM102A	family with sequence similarity 102 member A	1.82 x 10 ⁻³	-0.38
TTC39C	tetratricopeptide repeat domain 39C	1.82 x 10 ⁻³	-0.38
IGSF8	immunoglobulin superfamily member 8	1.83 x 10 ⁻³	-0.38
EMG1	EMG1 N1-specific pseudouridine methyltransferase	1.85 x 10 ⁻³	-0.38
SESN1	sestrin 1	1.85 x 10 ⁻³	-0.38

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
C2orf81	chromosome 2 open reading frame 81	1.86 x 10 ⁻³	-0.38
ELOVL4	ELOVL fatty acid elongase 4	1.86 x 10 ⁻³	-0.38
ZNF84	zinc finger protein 84	1.86 x 10 ⁻³	-0.38
FITM2	fat storage inducing transmembrane protein 2	1.87 x 10 ⁻³	-0.38
TRIM32	tripartite motif containing 32	1.88 x 10 ⁻³	-0.38
SLC9B2	solute carrier family 9 member B2	1.89 x 10 ⁻³	-0.38
PPP4R3B	protein phosphatase 4 regulatory subunit 3B	1.90 x 10 ⁻³	-0.38
RTL10	retrotransposon Gag like 10	1.91 x 10 ⁻³	-0.38
ABI2	abl interactor 2	1.92 x 10 ⁻³	-0.38
C12orf49	chromosome 12 open reading frame 49	1.92 x 10 ⁻³	-0.38
ANKRD13C	ankyrin repeat domain 13C	1.93 x 10 ⁻³	-0.38
FAM161A	FAM161 centrosomal protein A	1.94 x 10 ⁻³	-0.38
LINC00665	long intergenic non-protein coding RNA 665	1.94 x 10 ⁻³	-0.38
DDX24	DEAD-box helicase 24	1.95 x 10 ⁻³	-0.38
ZNF667	zinc finger protein 667	1.95 x 10 ⁻³	-0.37
FXVD7	FXVD domain containing ion transport regulator 7	1.96 x 10 ⁻³	-0.37
ZDHHC11	zinc finger DHHC-type containing 11	1.96 x 10 ⁻³	-0.37
NUP188	nucleoporin 188	1.97 x 10 ⁻³	-0.37
TSPAN3	tetraspanin 3	1.97 x 10 ⁻³	-0.37
PCYOX1	prenylcysteine oxidase 1	1.98 x 10 ⁻³	-0.37
KHDRBS2	KH RNA binding domain containing, signal transduction associated 2	1.99 x 10 ⁻³	-0.37
CYP2J2	cytochrome P450 family 2 subfamily J member 2	1.99 x 10 ⁻³	-0.37
MFHAS1	malignant fibrous histiocytoma amplified sequence 1	2.00 x 10 ⁻³	-0.37
MRPL35	mitochondrial ribosomal protein L35	2.01 x 10 ⁻³	-0.37
RBBP7	RB binding protein 7, chromatin remodeling factor	2.02 x 10 ⁻³	-0.37
TMEM156	transmembrane protein 156	2.03 x 10 ⁻³	-0.37
RASA3	RAS p21 protein activator 3	2.03 x 10 ⁻³	-0.37
ZNF263	zinc finger protein 263	2.03 x 10 ⁻³	-0.37
VMA21	vacuolar ATPase assembly factor VMA21	2.06 x 10 ⁻³	-0.37
SPAG16	sperm associated antigen 16	2.08 x 10 ⁻³	-0.37
SPATA5	spermatogenesis associated 5	2.08 x 10 ⁻³	-0.37
RABGEF1	RAB guanine nucleotide exchange factor 1	2.10 x 10 ⁻³	-0.37
GPATCH4	G-patch domain containing 4	2.11 x 10 ⁻³	-0.37
TRAV12-2	T cell receptor alpha variable 12-2	2.11 x 10 ⁻³	-0.37
PAN2	poly(A) specific ribonuclease subunit PAN2	2.12 x 10 ⁻³	-0.37
DMD	dystrophin	2.15 x 10 ⁻³	-0.37

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
PASK	PAS domain containing serine/threonine kinase	2.15 x 10 ⁻³	-0.37
IARS2	isoleucyl-tRNA synthetase 2, mitochondrial	2.16 x 10 ⁻³	-0.37
RPS23	ribosomal protein S23	2.16 x 10 ⁻³	-0.37
LGMN	legumain	2.18 x 10 ⁻³	-0.37
ZNF121	zinc finger protein 121	2.19 x 10 ⁻³	-0.37
ADAMTS6	ADAM metalloproteinase with thrombospondin type 1 motif 6	2.20 x 10 ⁻³	-0.37
CMTM8	CKLF like MARVEL transmembrane domain containing 8	2.20 x 10 ⁻³	-0.37
MTHFD1	methylenetetrahydrofolate dehydrogenase, cyclohydrolase and formyltetrahydrofolate synthetase 1	2.20 x 10 ⁻³	-0.37
CYCS	cytochrome c, somatic	2.21 x 10 ⁻³	-0.37
TRAF5	TNF receptor associated factor 5	2.23 x 10 ⁻³	-0.37
MIEF1	mitochondrial elongation factor 1	2.24 x 10 ⁻³	-0.37
ADAM28	ADAM metalloproteinase domain 28	2.25 x 10 ⁻³	-0.37
TCF7	transcription factor 7	2.25 x 10 ⁻³	-0.37
PTPN13	protein tyrosine phosphatase, non-receptor type 13	2.26 x 10 ⁻³	-0.37
BOC	BOC cell adhesion associated, oncogene regulated	2.30 x 10 ⁻³	-0.37
NOA1	nitric oxide associated 1	2.30 x 10 ⁻³	-0.37
TOMM70	translocase of outer mitochondrial membrane 70	2.30 x 10 ⁻³	-0.37
ZNF813	zinc finger protein 813	2.30 x 10 ⁻³	-0.37
DBNDD1	dysbindin domain containing 1	2.31 x 10 ⁻³	-0.37
SFMBT1	Scm like with four mbt domains 1	2.32 x 10 ⁻³	-0.37
SH2D3A	SH2 domain containing 3A	2.32 x 10 ⁻³	-0.37
TCEAL4	transcription elongation factor A like 4	2.33 x 10 ⁻³	-0.37
NEK8	NIMA related kinase 8	2.33 x 10 ⁻³	-0.37
HNRNPA0	heterogeneous nuclear ribonucleoprotein A0	2.35 x 10 ⁻³	-0.37
PEX14	peroxisomal biogenesis factor 14	2.35 x 10 ⁻³	-0.37
CSTF3	cleavage stimulation factor subunit 3	2.37 x 10 ⁻³	-0.37
EHMT2	euchromatic histone lysine methyltransferase 2	2.39 x 10 ⁻³	-0.37
DNAJC11	DnaJ heat shock protein family (Hsp40) member C11	2.40 x 10 ⁻³	-0.37
CFAP97	cilia and flagella associated protein 97	2.41 x 10 ⁻³	-0.37
PJA1	praja ring finger ubiquitin ligase 1	2.43 x 10 ⁻³	-0.37
RIC3	RIC3 acetylcholine receptor chaperone	2.43 x 10 ⁻³	-0.37
EEF1G	eukaryotic translation elongation factor 1 gamma	2.44 x 10 ⁻³	-0.37
RUVBL1	RuvB like AAA ATPase 1	2.45 x 10 ⁻³	-0.37
WASHC5	WASH complex subunit 5	2.45 x 10 ⁻³	-0.37
RNF157	ring finger protein 157	2.46 x 10 ⁻³	-0.37

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
ACACA	acetyl-CoA carboxylase alpha	2.47 x 10 ⁻³	-0.37
POLA1	DNA polymerase alpha 1, catalytic subunit	2.47 x 10 ⁻³	-0.37
ATP1A1	ATPase Na ⁺ /K ⁺ transporting subunit alpha 1	2.48 x 10 ⁻³	-0.37
MSTO1	misato mitochondrial distribution and morphology regulator 1	2.48 x 10 ⁻³	-0.37
LGALS8	galectin 8	2.49 x 10 ⁻³	-0.37
SAMM50	SAMM50 sorting and assembly machinery component	2.49 x 10 ⁻³	-0.37
SLC27A5	solute carrier family 27 member 5	2.49 x 10 ⁻³	-0.37
ZCCHC7	zinc finger CCHC-type containing 7	2.52 x 10 ⁻³	-0.37
NSG1	neuronal vesicle trafficking associated 1	2.52 x 10 ⁻³	-0.37
TLCD2	TLC domain containing 2	2.54 x 10 ⁻³	-0.37
PFN2	profilin 2	2.56 x 10 ⁻³	-0.37
SLC2A11	solute carrier family 2 member 11	2.56 x 10 ⁻³	-0.37

B Genes that increase expression with age

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
LATS2	large tumor suppressor kinase 2	3.67 x 10 ⁻⁶	0.54
CD46	CD46 molecule	1.23 x 10 ⁻⁵	0.51
TNFAIP2	TNF alpha induced protein 2	1.52 x 10 ⁻⁵	0.51
LST1	leukocyte specific transcript 1	2.67 x 10 ⁻⁵	0.49
SPTB	spectrin beta, erythrocytic	3.42 x 10 ⁻⁵	0.49
WIPI1	WD repeat domain, phosphoinositide interacting 1	3.47 x 10 ⁻⁵	0.49
CAPNS2	calpain small subunit 2	3.52 x 10 ⁻⁵	0.49
TPM3	tropomyosin 3	3.83 x 10 ⁻⁵	0.48
RFFL	ring finger and FYVE like domain containing E3 ubiquitin protein ligase	3.93 x 10 ⁻⁵	0.48
ARAP1	ArfGAP with RhoGAP domain, ankyrin repeat and PH domain 1	3.95 x 10 ⁻⁵	0.48
KIRREL3	kirre like nephrin family adhesion molecule 3	4.30 x 10 ⁻⁵	0.48
APC	APC regulator of WNT signaling pathway	4.43 x 10 ⁻⁵	0.48
PLEKHG3	pleckstrin homology and RhoGEF domain containing G3	4.60 x 10 ⁻⁵	0.48
ABHD5	abhydrolase domain containing 5	6.09 x 10 ⁻⁵	0.47
SAP30L	SAP30 like	6.51 x 10 ⁻⁵	0.47
NR6A1	nuclear receptor subfamily 6 group A member 1	6.75 x 10 ⁻⁵	0.47
TNFRSF12A	TNF receptor superfamily member 12A	7.03 x 10 ⁻⁵	0.47
C5orf58	chromosome 5 open reading frame 58	8.95 x 10 ⁻⁵	0.46
LRRFIP1	LRR binding FLII interacting protein 1	9.09 x 10 ⁻⁵	0.46
CDC42SE1	CDC42 small effector 1	1.03 x 10 ⁻⁴	0.46

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
NCF1	neutrophil cytosolic factor 1	1.04 x 10 ⁻⁴	0.46
DRC1	dynein regulatory complex subunit 1	1.07 x 10 ⁻⁴	0.46
MGAT3	mannosyl (beta-1,4-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase	1.10 x 10 ⁻⁴	0.46
CTSS	cathepsin S	1.11 x 10 ⁻⁴	0.46
ANKRD13D	ankyrin repeat domain 13D	1.12 x 10 ⁻⁴	0.46
RAMP1	receptor activity modifying protein 1	1.23 x 10 ⁻⁴	0.46
ORAI2	ORAI calcium release-activated calcium modulator 2	1.24 x 10 ⁻⁴	0.46
MSRB3	methionine sulfoxide reductase B3	1.27 x 10 ⁻⁴	0.45
CEACAM1	carcinoembryonic antigen related cell adhesion molecule 1	1.45 x 10 ⁻⁴	0.45
PBX2	PBX homeobox 2	1.47 x 10 ⁻⁴	0.45
CHMP1B	charged multivesicular body protein 1B	1.55 x 10 ⁻⁴	0.45
AZI2	5-azacytidine induced 2	1.55 x 10 ⁻⁴	0.45
TAF12	TATA-box binding protein associated factor 12	1.63 x 10 ⁻⁴	0.45
ANP32A-IT1	ANP32A intronic transcript 1	1.79 x 10 ⁻⁴	0.45
PKN2	protein kinase N2	1.90 x 10 ⁻⁴	0.44
CREB1	cAMP responsive element binding protein 1	1.95 x 10 ⁻⁴	0.44
TNK2	tyrosine kinase non receptor 2	1.96 x 10 ⁻⁴	0.44
VAMP1	vesicle associated membrane protein 1	2.02 x 10 ⁻⁴	0.44
RAB11FIP4	RAB11 family interacting protein 4	2.08 x 10 ⁻⁴	0.44
PHF20L1	PHD finger protein 20 like 1	2.30 x 10 ⁻⁴	0.44
TCAIM	T cell activation inhibitor, mitochondrial	2.31 x 10 ⁻⁴	0.44
REXO5	RNA exonuclease 5	2.35 x 10 ⁻⁴	0.44
BID	BH3 interacting domain death agonist	2.53 x 10 ⁻⁴	0.44
LPCAT2	lysophosphatidylcholine acyltransferase 2	2.61 x 10 ⁻⁴	0.44
NMNAT1	nicotinamide nucleotide adenylyltransferase 1	2.72 x 10 ⁻⁴	0.43
DHRS7	dehydrogenase/reductase 7	2.75 x 10 ⁻⁴	0.43
YIPF4	Yip1 domain family member 4	2.82 x 10 ⁻⁴	0.43
SPAG9	sperm associated antigen 9	2.96 x 10 ⁻⁴	0.43
MAX	MYC associated factor X	3.00 x 10 ⁻⁴	0.43
SLC15A4	solute carrier family 15 member 4	3.04 x 10 ⁻⁴	0.43
MLX	MAX dimerization protein MLX	3.07 x 10 ⁻⁴	0.43
RNF13	ring finger protein 13	3.12 x 10 ⁻⁴	0.43
APAF1	apoptotic peptidase activating factor 1	3.13 x 10 ⁻⁴	0.43
GPANK1	G-patch domain and ankyrin repeats 1	3.23 x 10 ⁻⁴	0.43
DNM2	dynamitin 2	3.26 x 10 ⁻⁴	0.43
DIPK2A	divergent protein kinase domain 2A	3.31 x 10 ⁻⁴	0.43
FAM53B-AS1	FAM53B antisense RNA 1	3.32 x 10 ⁻⁴	0.43
JDP2	Jun dimerization protein 2	3.39 x 10 ⁻⁴	0.43

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
RAB8B	RAB8B, member RAS oncogene family	3.40 x 10 ⁻⁴	0.43
C5orf56	chromosome 5 open reading frame 56	3.50 x 10 ⁻⁴	0.43
SCNN1A	sodium channel epithelial 1 alpha subunit	3.51 x 10 ⁻⁴	0.43
BIN3-IT1	BIN3 intronic transcript 1	3.52 x 10 ⁻⁴	0.43
CLDN9	claudin 9	3.58 x 10 ⁻⁴	0.43
KIAA0232	KIAA0232	3.58 x 10 ⁻⁴	0.43
LAMB1	laminin subunit beta 1	3.59 x 10 ⁻⁴	0.43
CALCOCO2	calcium binding and coiled-coil domain 2	3.60 x 10 ⁻⁴	0.43
TRIM33	tripartite motif containing 33	3.61 x 10 ⁻⁴	0.43
SLC16A6	solute carrier family 16 member 6	3.62 x 10 ⁻⁴	0.43
LYST	lysosomal trafficking regulator	3.69 x 10 ⁻⁴	0.43
MS4A6A	membrane spanning 4-domains A6A	3.73 x 10 ⁻⁴	0.43
LIMK1	LIM domain kinase 1	3.78 x 10 ⁻⁴	0.43
EPS15L1	epidermal growth factor receptor pathway substrate 15 like 1	3.79 x 10 ⁻⁴	0.43
TXNIP	thioredo x in interacting protein	3.80 x 10 ⁻⁴	0.43
TRIOBP	TRIO and F-actin binding protein	3.81 x 10 ⁻⁴	0.43
GBA2	glucosylceramidase beta 2	3.98 x 10 ⁻⁴	0.42
CGGBP1	CGG triplet repeat binding protein 1	4.12 x 10 ⁻⁴	0.42
SOX15	SRY-bo x 15	4.20 x 10 ⁻⁴	0.42
RNF17	ring finger protein 17	4.28 x 10 ⁻⁴	0.42
PPFIA1	PTPRF interacting protein alpha 1	4.33 x 10 ⁻⁴	0.42
SNAP29	synaptosome associated protein 29	4.43 x 10 ⁻⁴	0.42
IFNAR2	interferon alpha and beta receptor subunit 2	4.71 x 10 ⁻⁴	0.42
NCOA2	nuclear receptor coactivator 2	4.80 x 10 ⁻⁴	0.42
SRGN	serglycin	4.80 x 10 ⁻⁴	0.42
NCR1	natural cytoto x icity triggering receptor 1	4.83 x 10 ⁻⁴	0.42
MRPL44	mitochondrial ribosomal protein L44	4.84 x 10 ⁻⁴	0.42
CX3CR1	C-X3-C motif chemokine receptor 1	5.01 x 10 ⁻⁴	0.42
NFYA	nuclear transcription factor Y subunit alpha	5.01 x 10 ⁻⁴	0.42
TACC1	transforming acidic coiled-coil containing protein 1	5.23 x 10 ⁻⁴	0.42
RAMAC	RNA guanine-7 methyltransferase activating subunit	5.25 x 10 ⁻⁴	0.42
CPD	carbo x ypeptidase D	5.34 x 10 ⁻⁴	0.42
MBOAT1	membrane bound O-acyltransferase domain containing 1	5.47 x 10 ⁻⁴	0.41
CSAD	cysteine sulfinic acid decarbo x ylase	5.53 x 10 ⁻⁴	0.41
MYLIP	myosin regulatory light chain interacting protein	5.62 x 10 ⁻⁴	0.41
SV2B	synaptic vesicle glycoprotein 2B	5.74 x 10 ⁻⁴	0.41
PRSS30P	serine protease 30, pseudogene	5.93 x 10 ⁻⁴	0.41
TWIST2	twist family bHLH transcription factor 2	5.93 x 10 ⁻⁴	0.41

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
CD300A	CD300a molecule	6.02 x 10 ⁻⁴	0.41
ITPK1-AS1	ITPK1 antisense RNA 1	6.03 x 10 ⁻⁴	0.41
YPEL3	yippee like 3	6.24 x 10 ⁻⁴	0.41
STX3	synta x in 3	6.43 x 10 ⁻⁴	0.41
GSN	gelsolin	6.45 x 10 ⁻⁴	0.41
SSH1	slingshot protein phosphatase 1	6.48 x 10 ⁻⁴	0.41
UBALD1	UBA like domain containing 1	6.50 x 10 ⁻⁴	0.41
INPP4A	inositol polyphosphate-4-phosphatase type I A	6.59 x 10 ⁻⁴	0.41
FAM120A	family with sequence similarity 120A	6.65 x 10 ⁻⁴	0.41
FAM131A	family with sequence similarity 131 member A	6.74 x 10 ⁻⁴	0.41
PSTPIP2	proline-serine-threonine phosphatase interacting protein 2	6.78 x 10 ⁻⁴	0.41
NADSYN1	NAD synthetase 1	6.84 x 10 ⁻⁴	0.41
CUEDC1	CUE domain containing 1	6.91 x 10 ⁻⁴	0.41
UNC13D	unc-13 homolog D	7.01 x 10 ⁻⁴	0.41
STARD10	StAR related lipid transfer domain containing 10	7.12 x 10 ⁻⁴	0.41
DIP2B	disco interacting protein 2 homolog B	7.16 x 10 ⁻⁴	0.41
OGFRL1	opioid growth factor receptor like 1	7.28 x 10 ⁻⁴	0.41
RAB1A	RAB1A, member RAS oncogene family	7.38 x 10 ⁻⁴	0.41
SLC18A2	solute carrier family 18 member A2	7.45 x 10 ⁻⁴	0.41
FMNL1	formin like 1	7.51 x 10 ⁻⁴	0.41
TGFBR2	transforming growth factor beta receptor 2	7.51 x 10 ⁻⁴	0.41
NBN	nibrin	7.71 x 10 ⁻⁴	0.40
CD58	CD58 molecule	7.73 x 10 ⁻⁴	0.40
CCDC97	coiled-coil domain containing 97	7.79 x 10 ⁻⁴	0.40
CLRN1	clarin 1	7.92 x 10 ⁻⁴	0.40
ROCK1	Rho associated coiled-coil containing protein kinase 1	7.95 x 10 ⁻⁴	0.40
GLIS3-AS1	GLIS3 antisense RNA 1	8.18 x 10 ⁻⁴	0.40
STXBP5	synta x in binding protein 5	8.24 x 10 ⁻⁴	0.40
PRRG4	proline rich and Gla domain 4	8.32 x 10 ⁻⁴	0.40
DGLUCY	D-glutamate cyclase	8.49 x 10 ⁻⁴	0.40
NUP50	nucleoporin 50	8.56 x 10 ⁻⁴	0.40
JMJD6	jumonji domain containing 6, arginine demethylase and lysine hydroxylase	8.65 x 10 ⁻⁴	0.40
PDS5B	PDS5 cohesin associated factor B	8.72 x 10 ⁻⁴	0.40
SNAP23	synaptosome associated protein 23	8.90 x 10 ⁻⁴	0.40
CDS2	CDP-diacylglycerol synthase 2	8.97 x 10 ⁻⁴	0.40
DLEU2	deleted in lymphocytic leukemia 2	9.06 x 10 ⁻⁴	0.40
AGTR2	angiotensin II receptor type 2	9.10 x 10 ⁻⁴	0.40
VSTM1	V-set and transmembrane domain containing 1	9.14 x 10 ⁻⁴	0.40

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
KY	kyphoscoliosis peptidase	9.24 x 10 ⁻⁴	0.40
TOX4	TOX high mobility group box family member 4	9.27 x 10 ⁻⁴	0.40
RPGRIP1	RPGR interacting protein 1	9.34 x 10 ⁻⁴	0.40
DPP9	dipeptidyl peptidase 9	9.35 x 10 ⁻⁴	0.40
KCTD5	potassium channel tetramerization domain containing 5	9.52 x 10 ⁻⁴	0.40
LINC01341	long intergenic non-protein coding RNA 1341	9.68 x 10 ⁻⁴	0.40
QKI	QKI, KH domain containing RNA binding	9.69 x 10 ⁻⁴	0.40
SLC5A12	solute carrier family 5 member 12	9.75 x 10 ⁻⁴	0.40
S100A6	S100 calcium binding protein A6	9.82 x 10 ⁻⁴	0.40
STRN	striatin	9.87 x 10 ⁻⁴	0.40
ZFAND5	zinc finger AN1-type containing 5	1.01 x 10 ⁻³	0.40
PDLIM5	PDZ and LIM domain 5	1.02 x 10 ⁻³	0.40
MEGF9	multiple EGF like domains 9	1.02 x 10 ⁻³	0.40
PLIN5	perilipin 5	1.02 x 10 ⁻³	0.40
UNKL	unk like zinc finger	1.02 x 10 ⁻³	0.40
HDAC10	histone deacetylase 10	1.03 x 10 ⁻³	0.40
ZNF552	zinc finger protein 552	1.05 x 10 ⁻³	0.39
RGR	retinal G protein coupled receptor	1.06 x 10 ⁻³	0.39
IFITM10	interferon induced transmembrane protein 10	1.08 x 10 ⁻³	0.39
SHE	Src homology 2 domain containing E	1.08 x 10 ⁻³	0.39
COX6B1	cytochrome c oxidase subunit 6B1	1.09 x 10 ⁻³	0.39
ZBTB34	zinc finger and BTB domain containing 34	1.09 x 10 ⁻³	0.39
LPGAT1	lysophosphatidylglycerol acyltransferase 1	1.10 x 10 ⁻³	0.39
PTPN12	protein tyrosine phosphatase, non-receptor type 12	1.11 x 10 ⁻³	0.39
RNF130	ring finger protein 130	1.11 x 10 ⁻³	0.39
SP3	Sp3 transcription factor	1.12 x 10 ⁻³	0.39
TLE4	TLE family member 4, transcriptional corepressor	1.12 x 10 ⁻³	0.39
RNF114	ring finger protein 114	1.13 x 10 ⁻³	0.39
UBE2W	ubiquitin conjugating enzyme E2 W	1.15 x 10 ⁻³	0.39
PTTG2	pituitary tumor-transforming 2	1.18 x 10 ⁻³	0.39
UNC119	unc-119 lipid binding chaperone	1.23 x 10 ⁻³	0.39
IKBIP	IKKB interacting protein	1.25 x 10 ⁻³	0.39
KIF13A	kinesin family member 13A	1.26 x 10 ⁻³	0.39
MCAM	melanoma cell adhesion molecule	1.27 x 10 ⁻³	0.39
APBB1IP	amyloid beta precursor protein binding family B member 1 interacting protein	1.28 x 10 ⁻³	0.39
FEZ2	fasciculation and elongation protein zeta 2	1.28 x 10 ⁻³	0.39
OSBPL6	oxysterol binding protein like 6	1.32 x 10 ⁻³	0.39
PDK3	pyruvate dehydrogenase kinase 3	1.33 x 10 ⁻³	0.39

Gene Symbol	Gene Name	P value (FDR-adjusted)	r (partial correlation coefficient)
PRAC2	PRAC2 small nuclear protein	1.33 x 10 ⁻³	0.39
CHRN3	cholinergic receptor nicotinic beta 3 subunit	1.34 x 10 ⁻³	0.39
GDAP2	ganglioside induced differentiation associated protein 2	1.34 x 10 ⁻³	0.39
LPIN3	lipin 3	1.34 x 10 ⁻³	0.39
CCDC170	coiled-coil domain containing 170	1.35 x 10 ⁻³	0.39
LINC-PINT	long intergenic non-protein coding RNA, p53 induced transcript	1.35 x 10 ⁻³	0.39
PRKAR1A	protein kinase cAMP-dependent type I regulatory subunit alpha	1.35 x 10 ⁻³	0.39
SYTL3	synaptotagmin like 3	1.36 x 10 ⁻³	0.39
RBMS1	RNA binding motif single stranded interacting protein 1	1.37 x 10 ⁻³	0.39
CLEC4E	C-type lectin domain family 4 member E	1.38 x 10 ⁻³	0.39
PCYT1A	phosphate cytidyltransferase 1, choline, alpha	1.39 x 10 ⁻³	0.39
HSPA12B	heat shock protein family A (Hsp70) member 12B	1.40 x 10 ⁻³	0.39
TGOLN2	trans-golgi network protein 2	1.41 x 10 ⁻³	0.39
CASP8	caspase 8	1.42 x 10 ⁻³	0.39
SLC45A4	solute carrier family 45 member 4	1.45 x 10 ⁻³	0.38
HTATIP2	HIV-1 Tat interactive protein 2	1.47 x 10 ⁻³	0.38
GALNT17	polypeptide N-acetylgalactosaminyltransferase 17	1.47 x 10 ⁻³	0.38
C7orf61	chromosome 7 open reading frame 61	1.48 x 10 ⁻³	0.38
FLI1	Fli-1 proto-oncogene, ETS transcription factor	1.48 x 10 ⁻³	0.38
CHD2	chromodomain helicase DNA binding protein 2	1.48 x 10 ⁻³	0.38
SDF2	stromal cell derived factor 2	1.48 x 10 ⁻³	0.38
CHIC2	cysteine rich hydrophobic domain 2	1.54 x 10 ⁻³	0.38
HIST1H2AJ	histone cluster 1 H2A family member j	1.55 x 10 ⁻³	0.38
HIST1H3I	histone cluster 1 H3 family member i	1.56 x 10 ⁻³	0.38
OGA	O-GlcNAcase	1.56 x 10 ⁻³	0.38
SMPDL3A	sphingomyelin phosphodiesterase acid like 3A	1.56 x 10 ⁻³	0.38
CACNA1I	calcium voltage-gated channel subunit alpha 1 I	1.57 x 10 ⁻³	0.38
RBM5	RNA binding motif protein 5	1.57 x 10 ⁻³	0.38
MTMR14	myotubularin related protein 14	1.58 x 10 ⁻³	0.38
PARP8	poly(ADP-ribose) polymerase family member 8	1.59 x 10 ⁻³	0.38
UBE2O	ubiquitin conjugating enzyme E2 O	1.61 x 10 ⁻³	0.38
SNX20	sorting nexin 20	1.63 x 10 ⁻³	0.38
EVA1B	eva-1 homolog B	1.65 x 10 ⁻³	0.38
TMEM154	transmembrane protein 154	1.65 x 10 ⁻³	0.38
GUCY2D	guanylate cyclase 2D, retinal	1.67 x 10 ⁻³	0.38
NMUR1	neuromedin U receptor 1	1.71 x 10 ⁻³	0.38
XIAP	X-linked inhibitor of apoptosis	1.73 x 10 ⁻³	0.38
AKT1	AKT serine/threonine kinase 1	1.74 x 10 ⁻³	0.38

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
GABARAPL1	GABA type A receptor associated protein like 1	1.75 x 10 ⁻³	0.38
PGS1	phosphatidylglycerophosphate synthase 1	1.76 x 10 ⁻³	0.38
PPP1R12B	protein phosphatase 1 regulatory subunit 12B	1.82 x 10 ⁻³	0.38
SIRPB2	signal regulatory protein beta 2	1.82 x 10 ⁻³	0.38
CASS4	Cas scaffold protein family member 4	1.83 x 10 ⁻³	0.38
PMAIP1	phorbol-12-myristate-13-acetate-induced protein 1	1.85 x 10 ⁻³	0.38
ADGRV1	adhesion G protein-coupled receptor V1	1.86 x 10 ⁻³	0.38
RBP7	retinol binding protein 7	1.86 x 10 ⁻³	0.38
TRIM56	tripartite motif containing 56	1.86 x 10 ⁻³	0.38
MTG2	mitochondrial ribosome associated GTPase 2	1.89 x 10 ⁻³	0.38
PSMB8-AS1	PSMB8 antisense RNA 1 (head to head)	1.91 x 10 ⁻³	0.38
FBXL20	F-box and leucine rich repeat protein 20	1.92 x 10 ⁻³	0.38
PGM2	phosphoglucomutase 2	1.92 x 10 ⁻³	0.38
CLMP	CXADR like membrane protein	1.95 x 10 ⁻³	0.37
FAM192A	family with sequence similarity 192 member A	1.96 x 10 ⁻³	0.37
ZDHHC18	zinc finger DHHC-type containing 18	1.96 x 10 ⁻³	0.37
ARHGEF2	Rho/Rac guanine nucleotide exchange factor 2	1.97 x 10 ⁻³	0.37
SLC6A6	solute carrier family 6 member 6	1.98 x 10 ⁻³	0.37
ARHGAP27	Rho GTPase activating protein 27	2.00 x 10 ⁻³	0.37
SH2D3C	SH2 domain containing 3C	2.00 x 10 ⁻³	0.37
USF3	upstream transcription factor family member 3	2.03 x 10 ⁻³	0.37
STX11	syntaxin 11	2.06 x 10 ⁻³	0.37
PTPRJ	protein tyrosine phosphatase, receptor type J	2.07 x 10 ⁻³	0.37
RASGEF1A	RasGEF domain family member 1A	2.07 x 10 ⁻³	0.37
RC3H1	ring finger and CCCH-type domains 1	2.08 x 10 ⁻³	0.37
SVOP	SV2 related protein	2.08 x 10 ⁻³	0.37
IFRD1	interferon related developmental regulator 1	2.10 x 10 ⁻³	0.37
HIST1H2AC	histone cluster 1 H2A family member c	2.13 x 10 ⁻³	0.37
IRF1	interferon regulatory factor 1	2.17 x 10 ⁻³	0.37
POLR2J	RNA polymerase II subunit J	2.18 x 10 ⁻³	0.37
LINC00527	long intergenic non-protein coding RNA 527	2.19 x 10 ⁻³	0.37
GLIPR1	GLI pathogenesis related 1	2.23 x 10 ⁻³	0.37
KLK12	kallikrein related peptidase 12	2.26 x 10 ⁻³	0.37
LGALS1	galectin like	2.27 x 10 ⁻³	0.37
MAT2B	methionine adenosyltransferase 2B	2.27 x 10 ⁻³	0.37
TUT7	terminal uridylyl transferase 7	2.28 x 10 ⁻³	0.37
ADIRF	adipogenesis regulatory factor	2.32 x 10 ⁻³	0.37
APOBEC3G	apolipoprotein B mRNA editing enzyme catalytic subunit 3G	2.34 x 10 ⁻³	0.37

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)	<i>r</i> (partial correlation coefficient)
BAHCC1	BAH domain and coiled-coil containing 1	2.34 x 10 ⁻³	0.37
FAM163A	family with sequence similarity 163 member A	2.34 x 10 ⁻³	0.37
ALOX5AP	arachidonate 5-lipo x ygenase activating protein	2.36 x 10 ⁻³	0.37
HIST1H2AI	histone cluster 1 H2A family member i	2.36 x 10 ⁻³	0.37
TRIM13	tripartite motif containing 13	2.41 x 10 ⁻³	0.37
ATG7	autophagy related 7	2.44 x 10 ⁻³	0.37
STAT1	signal transducer and activator of transcription 1	2.45 x 10 ⁻³	0.37
CYGB	cytoglobin	2.48 x 10 ⁻³	0.37
IFNGR1	interferon gamma receptor 1	2.49 x 10 ⁻³	0.37
EFHD2	EF-hand domain family member D2	2.51 x 10 ⁻³	0.37
MAP3K11	mitogen-activated protein kinase 11	2.53 x 10 ⁻³	0.37
PRKAG2	protein kinase AMP-activated non-catalytic subunit gamma 2	2.53 x 10 ⁻³	0.37
ARSG	arylsulfatase G	2.55 x 10 ⁻³	0.37
TBC1D2B	TCB1 domain family member 2B	2.56 x 10 ⁻³	0.37

Table III. Genes Associated with Age Expressed in Cohort 1 and Confirmed in Cohort 2 in Patients with Ischemic Stroke

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)		<i>r</i> (partial correlation coefficient)		Present In*	
		Cohort 1	Cohort 2	Cohort 1	Cohort 2	Peters (2015) Study ²²	Digital Ageing Atlas ²³
ABLIM1	actin binding LIM protein 1	1.32 x 10 ⁻⁴	1.35 x 10 ⁻⁴	-0.39	-0.45	1	1
ADAM28	ADAM metalloproteinase domain 28	1.66 x 10 ⁻⁴	2.25 x 10 ⁻³	-0.39	-0.37	0	0
AGMAT	agmatinase	1.81 x 10 ⁻⁴	2.18 x 10 ⁻⁵	-0.39	-0.50	1	0
ATF7IP2	activating transcription factor 7 interacting protein 2	8.74 x 10 ⁻⁵	3.74 x 10 ⁻⁴	-0.40	-0.43	1	0
B3GALT2	beta-1,3-galactosyltransferase 2	1.02 x 10 ⁻⁴	3.56 x 10 ⁻⁴	-0.40	-0.43	1	0
BANK1	B cell scaffold protein with ankyrin repeats 1	6.27 x 10 ⁻⁶	5.67 x 10 ⁻⁶	-0.46	-0.53	1	0
BCL11A	BAF chromatin remodeling complex subunit BCL11A	2.76 x 10 ⁻⁴	4.41 x 10 ⁻⁴	-0.38	-0.42	1	1
BCL7A	BAF chromatin remodeling complex subunit BCL7A	1.97 x 10 ⁻⁴	4.14 x 10 ⁻⁴	-0.39	-0.42	0	0
BLNK	B cell linker	1.23 x 10 ⁻⁵	5.61 x 10 ⁻⁶	-0.45	-0.53	0	0
BTLA	B and T lymphocyte associated	3.66 x 10 ⁻⁶	1.80 x 10 ⁻³	-0.47	-0.38	1	0
CAMK4	calcium/calmodulin dependent protein kinase IV	2.45 x 10 ⁻⁴	3.26 x 10 ⁻⁴	-0.38	-0.43	1	1
CCR6	C-C motif chemokine receptor 6	2.04 x 10 ⁻⁷	2.27 x 10 ⁻⁶	-0.52	-0.55	1	0
CCR7	C-C motif chemokine receptor 7	1.62 x 10 ⁻⁴	1.82 x 10 ⁻⁴	-0.39	-0.45	1	0
CD27	CD27 molecule	1.87 x 10 ⁻⁴	1.33 x 10 ⁻³	-0.39	-0.39	1	0
CD79B	CD79b molecule	3.29 x 10 ⁻⁵	2.31 x 10 ⁻⁵	-0.43	-0.50	1	1
CDCA7L	cell division cycle associated 7 like	4.39 x 10 ⁻⁵	1.70 x 10 ⁻⁵	-0.42	-0.50	1	0
CMSS1	cms1 ribosomal small subunit homolog	4.32 x 10 ⁻⁴	1.38 x 10 ⁻³	-0.37	-0.39	1	1
COBLL1	cordon-bleu WH2 repeat protein like 1	2.02 x 10 ⁻⁵	6.07 x 10 ⁻⁵	-0.44	-0.47	1	0
CR2	complement C3d receptor 2	2.75 x 10 ⁻⁶	3.22 x 10 ⁻⁶	-0.47	-0.54	1	0
CXCR5	C-X-C motif chemokine receptor 5	9.97 x 10 ⁻⁵	4.62 x 10 ⁻⁷	-0.40	-0.57	1	0
EPHA4	EPH receptor A4	4.14 x 10 ⁻⁴	1.80 x 10 ⁻⁵	-0.37	-0.50	1	0
NIBAN3	niban apoptosis regulator 3	4.49 x 10 ⁻⁶	3.33 x 10 ⁻⁴	-0.47	-0.43	1	0
FCER2	Fc fragment of IgE receptor II	1.84 x 10 ⁻⁴	2.92 x 10 ⁻⁴	-0.39	-0.43	0	0
FCRL1	Fc receptor like 1	3.67 x 10 ⁻⁵	3.26 x 10 ⁻⁴	-0.42	-0.43	0	0
FCRL2	Fc receptor like 2	7.17 x 10 ⁻⁵	2.87 x 10 ⁻⁵	-0.41	-0.49	0	0
FCRLA	Fc receptor like A	7.05 x 10 ⁻⁵	3.99 x 10 ⁻⁶	-0.41	-0.53	1	0
GPR183	G protein-coupled receptor 183	1.93 x 10 ⁻⁴	1.35 x 10 ⁻³	-0.39	-0.39	0	0
ID3	inhibitor of DNA binding 3, HLH protein	1.48 x 10 ⁻⁴	1.28 x 10 ⁻⁴	-0.39	-0.45	1	0
IFT57	intraflagellar transport 57	2.56 x 10 ⁻⁴	2.65 x 10 ⁻⁴	-0.38	-0.44	0	0
IGHM	immunoglobulin heavy constant mu	5.17 x 10 ⁻⁴	3.04 x 10 ⁻⁶	-0.36	-0.54	0	0

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)		<i>r</i> (partial correlation coefficient)		Present In*	
		Cohort 1	Cohort 2	Cohort 1	Cohort 2	Peters (2015) Study ²²	Digital Ageing Atlas ²³
ITPR1	inositol 1,4,5-trisphosphate receptor type 1	3.41 x 10 ⁻⁴	1.36 x 10 ⁻⁴	-0.37	-0.45	0	0
KAT2A	lysine acetyltransferase 2A	5.25 x 10 ⁻⁵	1.46 x 10 ⁻³	-0.42	-0.38	1	1
KHDRBS2	KH RNA binding domain containing, signal transduction associated 2	1.42 x 10 ⁻⁴	1.99 x 10 ⁻³	-0.39	-0.37	0	0
KIF5C	kinesin family member 5C	5.18 x 10 ⁻⁴	8.44 x 10 ⁻⁶	-0.36	-0.52	1	0
KLHL14	kelch like family member 14	3.67 x 10 ⁻⁵	3.80 x 10 ⁻⁵	-0.42	-0.48	0	0
LDHB	lactate dehydrogenase B	1.71 x 10 ⁻⁴	8.14 x 10 ⁻⁴	-0.39	-0.40	1	0
LEF1-AS1	LEF1 antisense RNA 1	1.86 x 10 ⁻⁴	1.76 x 10 ⁻³	-0.39	-0.38	0	0
MGAT5	alpha-1,6-mannosylglycoprotein 6-beta-N-acetylglucosaminyltransferase	7.32 x 10 ⁻⁶	1.45 x 10 ⁻⁴	-0.46	-0.45	0	0
NBEA	neurobeachin	8.38 x 10 ⁻⁶	3.86 x 10 ⁻⁷	-0.45	-0.58	1	0
NELL2	neural EGFL like 2	1.81 x 10 ⁻⁴	3.67 x 10 ⁻⁴	-0.39	-0.43	1	0
NT5E	5'-nucleotidase ecto	2.44 x 10 ⁻⁸	1.46 x 10 ⁻⁶	-0.55	-0.55	1	0
OSBPL10	oxysterol binding protein like 10	5.52 x 10 ⁻⁵	1.08 x 10 ⁻⁶	-0.41	-0.56	1	0
P2RX5	purinergic receptor P2X 5	2.15 x 10 ⁻⁶	5.31 x 10 ⁻⁶	-0.48	-0.53	1	0
PAX5	paired box 5	1.12 x 10 ⁻⁴	3.90 x 10 ⁻⁵	-0.40	-0.48	0	0
PDLIM5	PDZ and LIM domain 5	4.74 x 10 ⁻⁴	1.02 x 10 ⁻³	0.36	0.40	0	0
PIK3C2B	phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 beta	3.18 x 10 ⁻⁴	2.01 x 10 ⁻⁵	-0.37	-0.50	1	0
PLEKHG1	pleckstrin homology and RhoGEF domain containing G1	5.54 x 10 ⁻⁵	1.55 x 10 ⁻⁴	-0.41	-0.45	0	0
PLPP5	phospholipid phosphatase 5	5.05 x 10 ⁻⁴	1.08 x 10 ⁻⁴	-0.36	-0.46	0	0
POU2AF1	POU class 2 associating factor 1	3.34 x 10 ⁻⁴	2.23 x 10 ⁻⁵	-0.37	-0.50	1	0
PTPRK	protein tyrosine phosphatase, receptor type K	2.37 x 10 ⁻⁶	2.87 x 10 ⁻⁵	-0.48	-0.49	1	0
QRSL1	glutamyl-tRNA amidotransferase subunit QRSL1	7.28 x 10 ⁻⁵	1.65 x 10 ⁻⁵	-0.41	-0.50	0	0
RAB30	RAB30, member RAS oncogene family	1.96 x 10 ⁻⁵	7.05 x 10 ⁻⁶	-0.44	-0.52	0	0
RALGPS2	Ral GEF with PH domain and SH3 binding motif 2	3.21 x 10 ⁻⁵	4.09 x 10 ⁻⁶	-0.43	-0.53	0	0
RASGRP3	RAS guanyl releasing protein 3	3.83 x 10 ⁻⁶	4.85 x 10 ⁻⁴	-0.47	-0.42	1	0
RPL22	ribosomal protein L22	4.65 x 10 ⁻⁵	1.00 x 10 ⁻³	-0.42	-0.40	1	0
SEL1L3	SEL1L family member 3	2.91 x 10 ⁻⁴	4.75 x 10 ⁻⁷	-0.38	-0.57	1	0
SESN1	sestrin 1	1.54 x 10 ⁻⁴	1.85 x 10 ⁻³	-0.39	-0.38	1	0
SHISAL2A	shisa like 2A	3.43 x 10 ⁻⁴	8.14 x 10 ⁻⁴	-0.37	-0.40	0	0
SLC9A7	solute carrier family 9 member A7	4.95 x 10 ⁻⁵	1.29 x 10 ⁻³	-0.42	-0.39	0	0
SPIB	Spi-B transcription factor	1.14 x 10 ⁻⁴	3.81 x 10 ⁻⁵	-0.40	-0.48	1	0
SPRY1	sprouty RTK signaling antagonist 1	7.46 x 10 ⁻⁵	7.62 x 10 ⁻⁴	-0.41	-0.40	1	0

Gene Symbol	Gene Name	<i>P</i> value (FDR-adjusted)		<i>r</i> (partial correlation coefficient)		Present In*	
		Cohort 1	Cohort 2	Cohort 1	Cohort 2	Peters (2015) Study ²²	Digital Ageing Atlas ²³
STRBP	spermatid perinuclear RNA binding protein	7.96 x 10 ⁻⁶	6.70 x 10 ⁻⁵	-0.45	-0.47	1	0
TCL6	T cell leukemia/lymphoma 6	2.70 x 10 ⁻⁴	1.47 x 10 ⁻³	-0.38	-0.38	0	0
TMEM156	transmembrane protein 156	3.98 x 10 ⁻⁴	2.03 x 10 ⁻³	-0.37	-0.37	1	0
TMEM204	transmembrane protein 204	4.95 x 10 ⁻⁴	3.79 x 10 ⁻⁴	-0.36	-0.43	1	0
TPD52	tumor protein D52	1.28 x 10 ⁻⁴	1.40 x 10 ⁻⁵	-0.40	-0.51	0	1
USP6NL	USP6 N-terminal like	2.34 x 10 ⁻⁶	1.09 x 10 ⁻³	-0.48	-0.39	0	0
VPREB3	V-set pre-B cell surrogate light chain 3	3.19 x 10 ⁻⁴	1.10 x 10 ⁻⁴	-0.37	-0.46	1	0
ZCCHC7	zinc finger CCHC-type containing 7	3.70 x 10 ⁻⁴	2.52 x 10 ⁻³	-0.37	-0.37	1	0

*1=present, 0=not present.