

Supplementary information

Mitochondrial Transporter Expression Patterns Distinguish Tumor from Normal Tissue and Identify Cancer Subtypes with Different Survival and Metabolism

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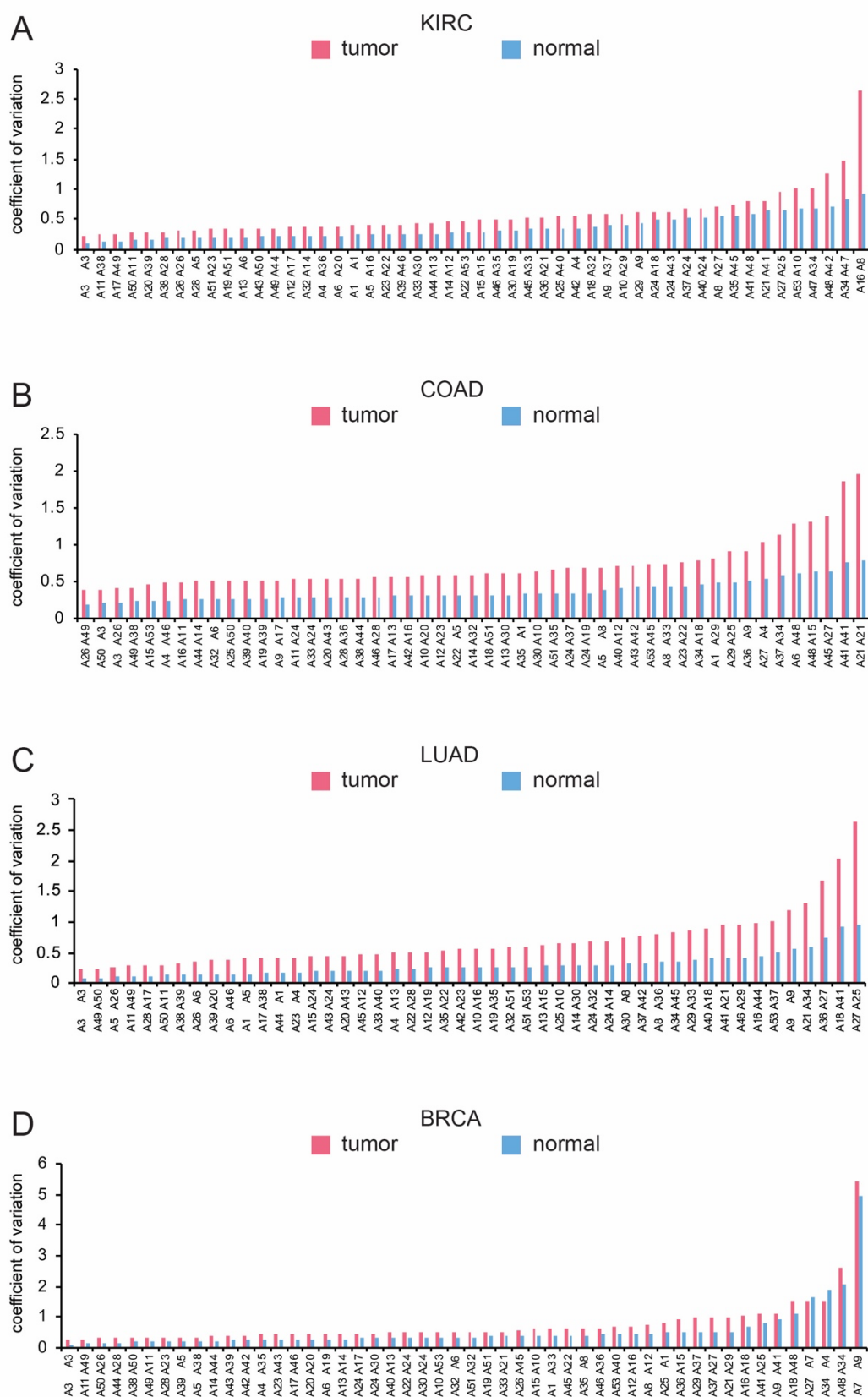


Figure S1.

Coefficient of variation (standard deviation/mean) of transporter FPKM/sum of MitoCarta gene FPKMs from tumor and normal tissue for kidney [(A) KIRC], colon [(B) COAD], lung [(C) LUAD], and breast [(D) BRCA].

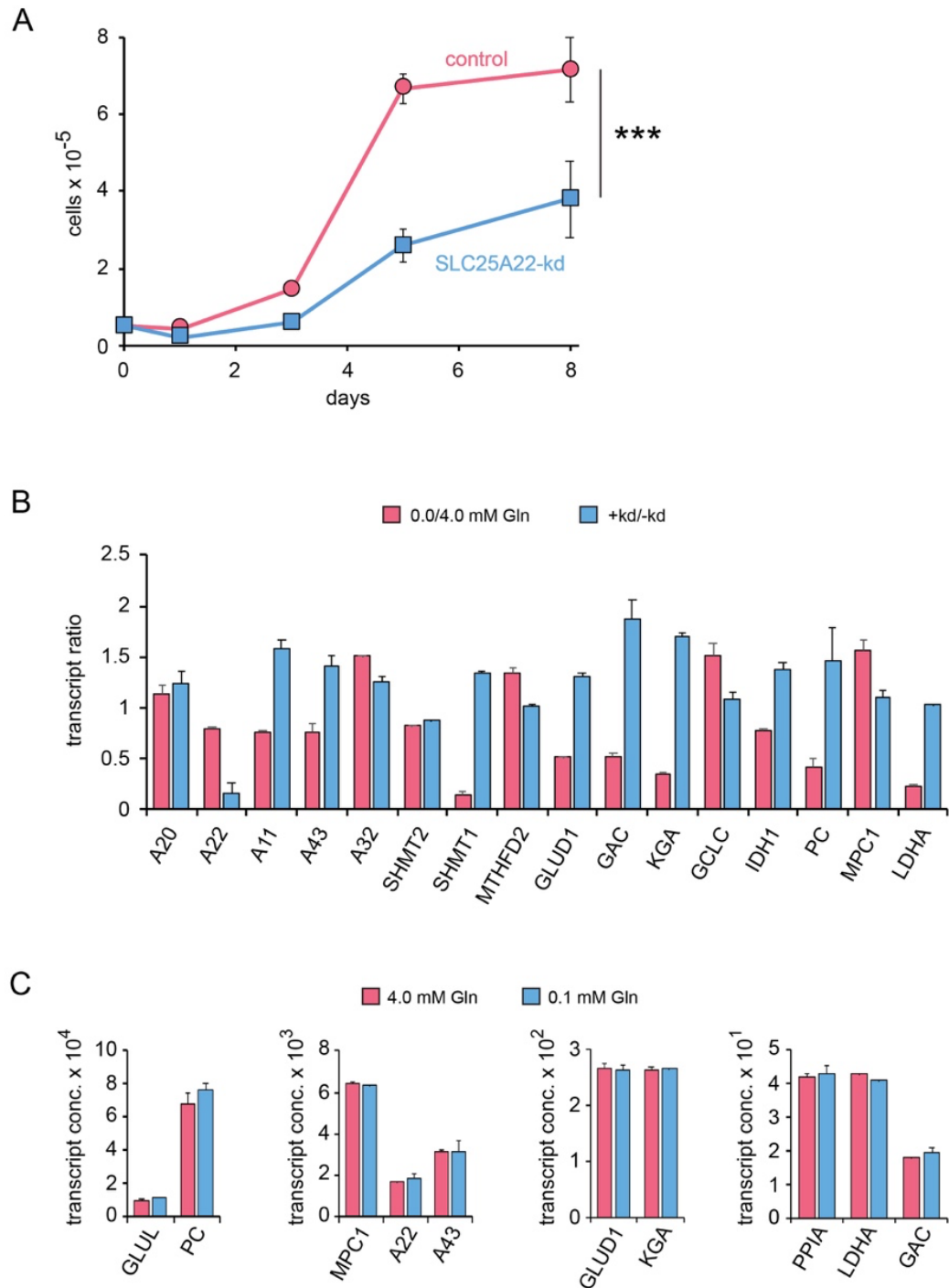


Figure S3.

Effect of SLC25A22 depletion and glutamine on Caki-1 cells. **A**, Growth curves of Caki-1 cells with or without knockdown of SLC25A22. Error bars represent standard deviations ($n=3$); $\delta = p < 0.01$. **B**, Effect of glutamine deprivation (red bars) or SLC25A22 depletion on transcript ratios of genes as listed on the abscissa. Error bars represent standard deviations ($n=4$). **C**, Transcript concentrations of indicated genes of Caki-1 cells grown in DMEM medium (10% fetal bovine serum supplemented) with 4.0mM or 0.1mM glutamine. Error bars show range (high-low/2) of duplicate experiments.

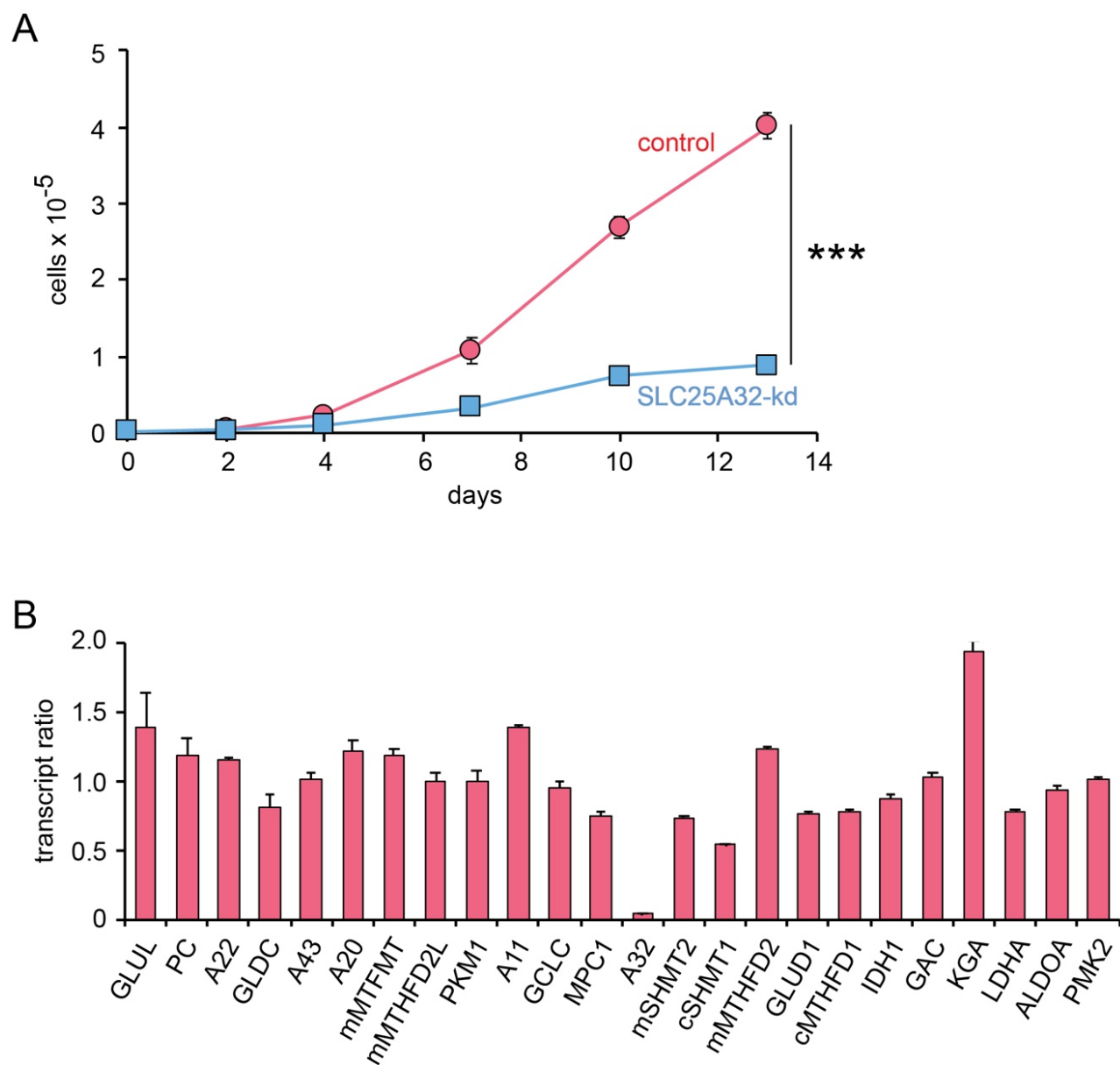


Figure S4.

Effect of SLC25A32 depletion on Caki-1 cells. **A**, Growth curves of Caki-1 cells with and without knockdown of SLC25A32. Error bars represent standard deviations (n=3). **B**, Ratios of gene transcripts of SLC25A32 knockdown cells over control cells. Error bars represent standard deviations (n=4). Labels 'm' and 'c' of enzyme abbreviations refer to mitochondrial and cytosolic, respectively.

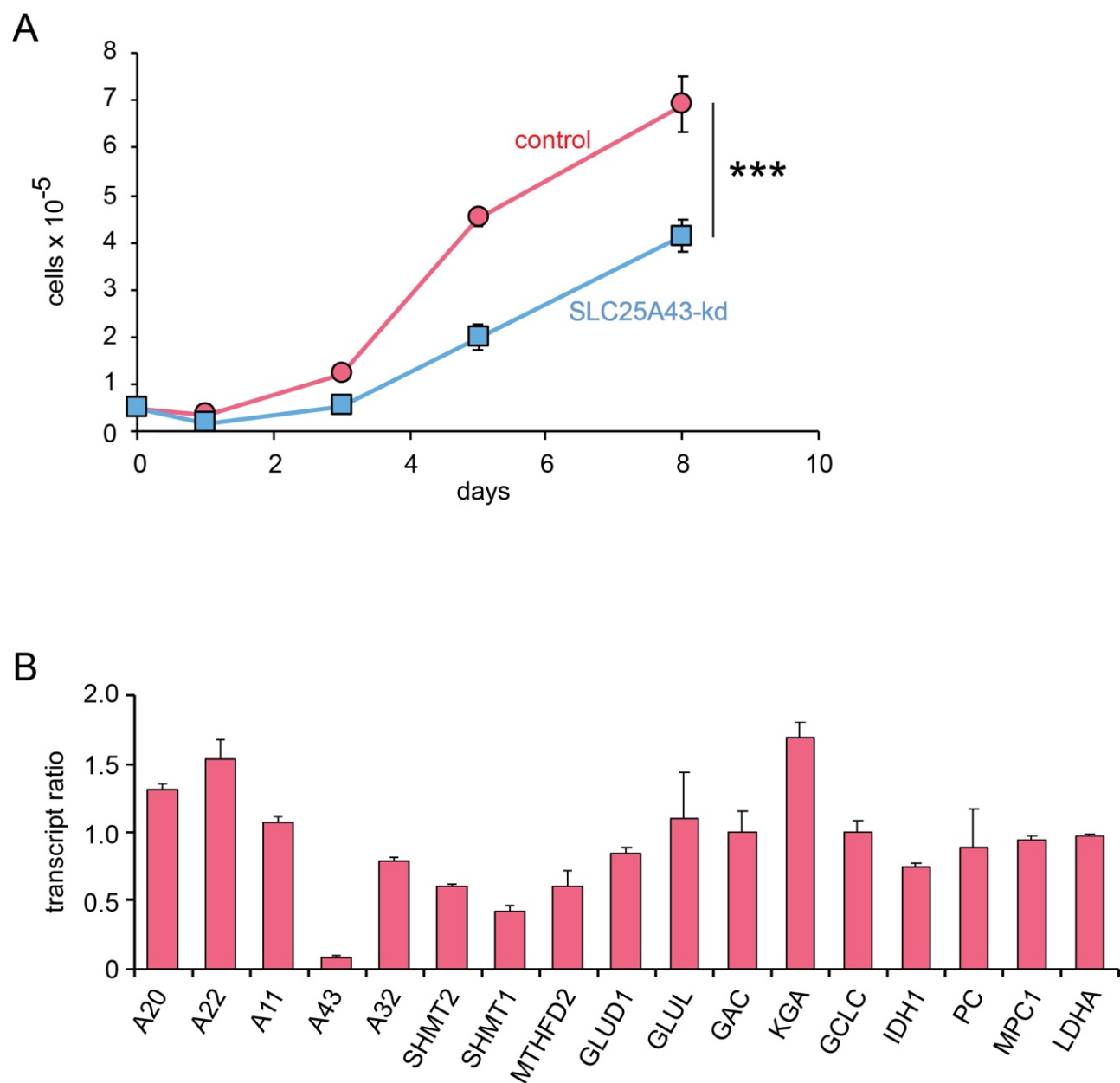


Figure S5.

Effect of SLC25A43 depletion on Caki-1 cells. **A**, Growth curves of Caki-1 cells with or without A43 knockdown. Error bars represent standard deviations (n=3). **B**, Ratios of gene transcripts of SLC25A43 knockdown cells over control cells. Error bars represent standard deviations (n=4).

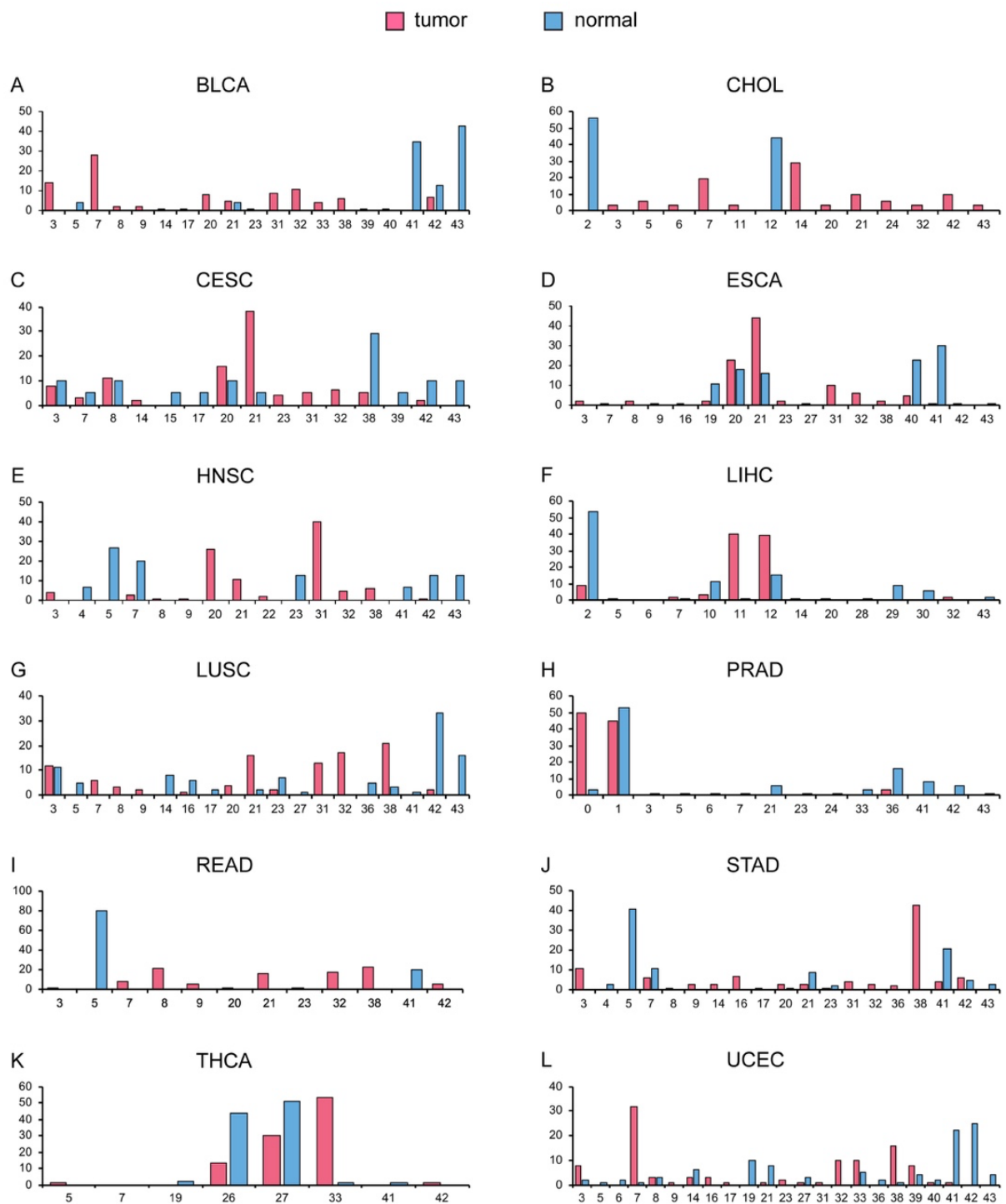


Figure S6.

SLC25 transporter expression cluster distributions for twelve forms of human cancer and corresponding normal tissues.

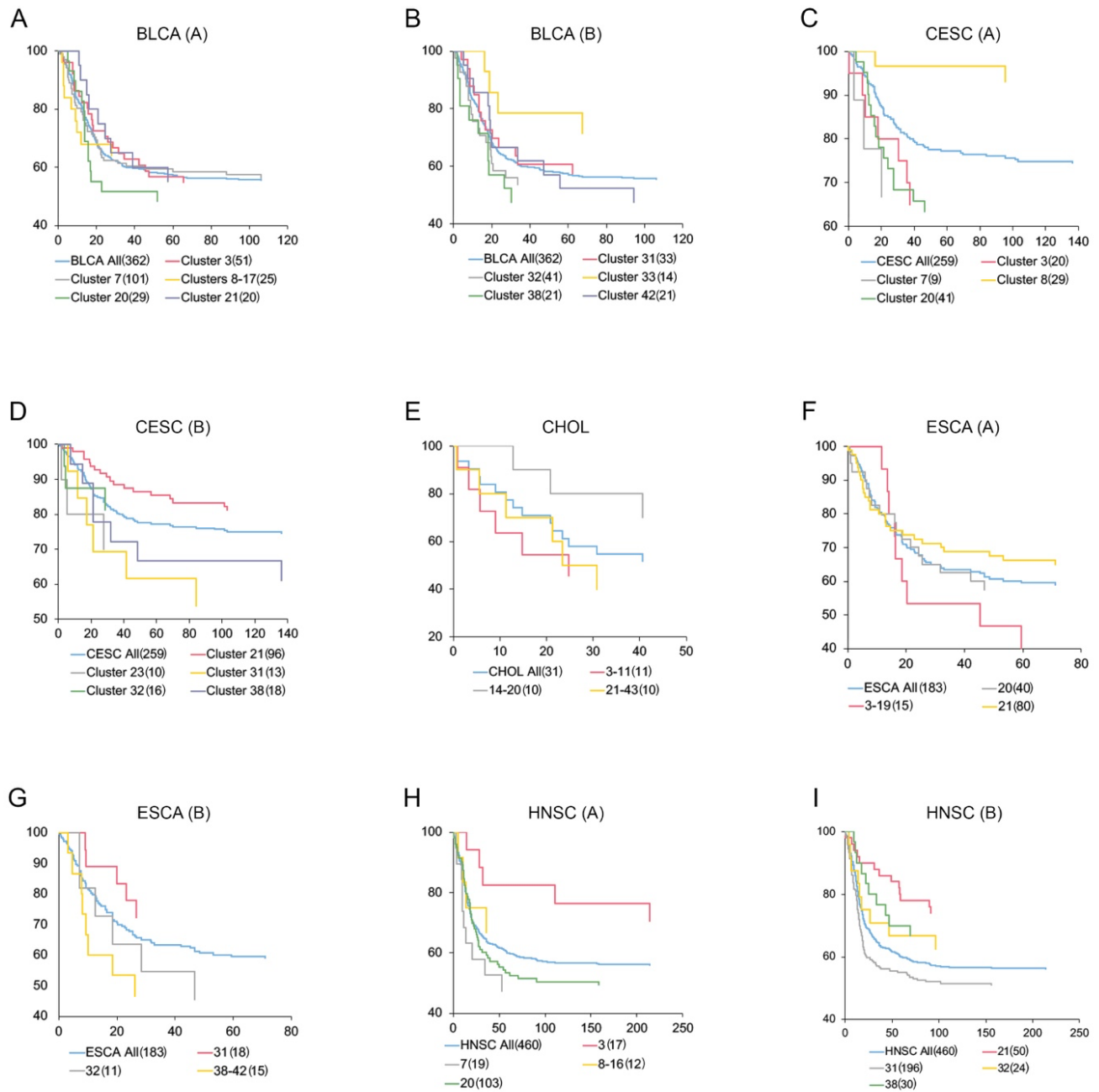


Figure S7.

Kaplan-Meier plots of patients grouped by SLC25 expression cluster, as well as the total number of patients with a given cancer form ('All'). The number of patients of each cluster or group of clusters used in the Kaplan-Meier plots is noted in parentheses.

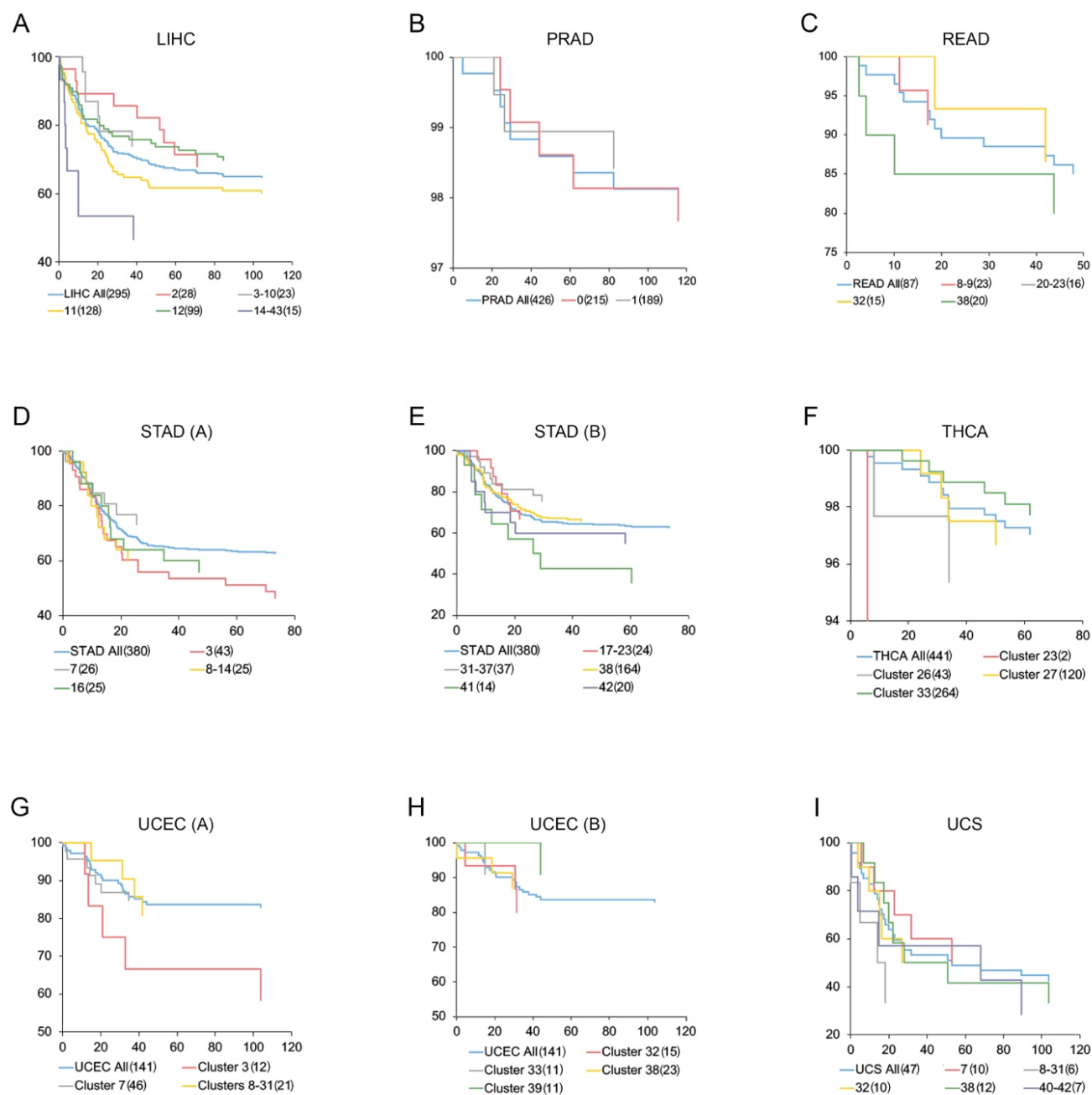


Figure S8.

Kaplan-Meier plots of patients grouped by SLC25 expression cluster, as well as the total number of patients with a given cancer form ('All'). The number of patients of each cluster or group of clusters used in the Kaplan-Meier plots is noted in parentheses.

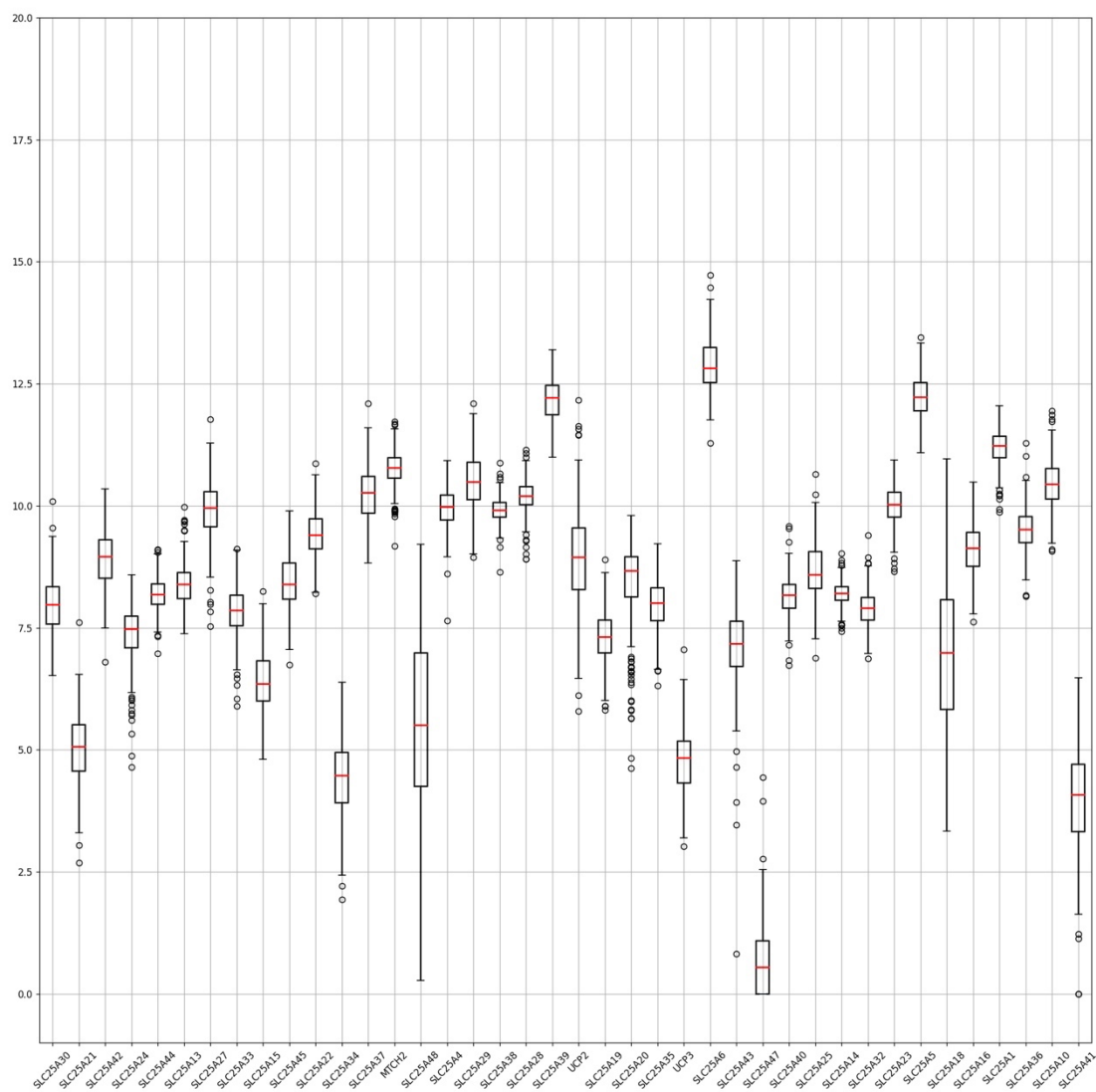


Figure S9A.

Boxplot of SLC25 transporter expression cluster 0 of TCGA tumors (log₂FPKM)

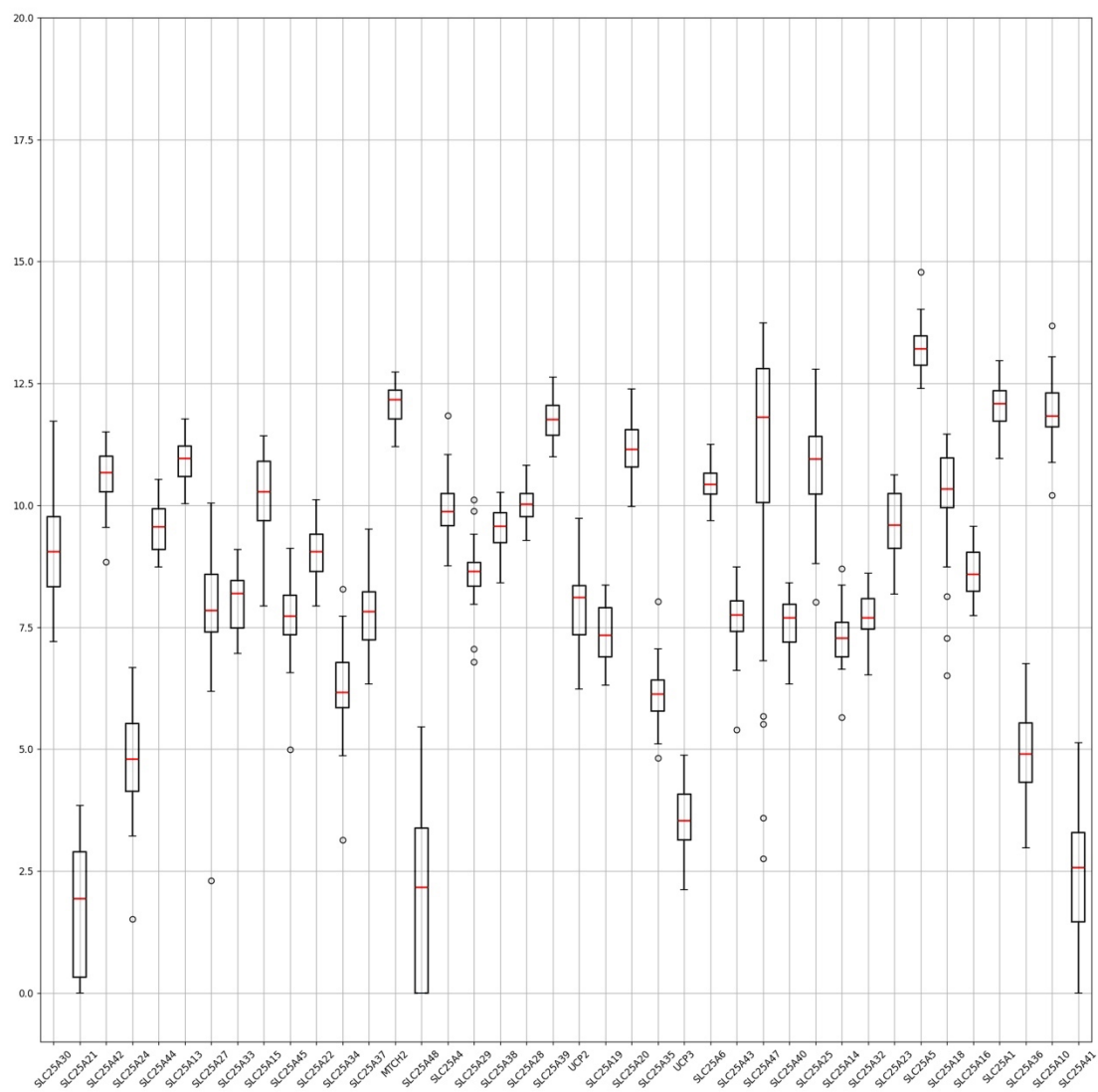


Figure S9C.

Boxplot of SLC25 transporter expression cluster 2 of TCGA tumors (log₂FPKM)

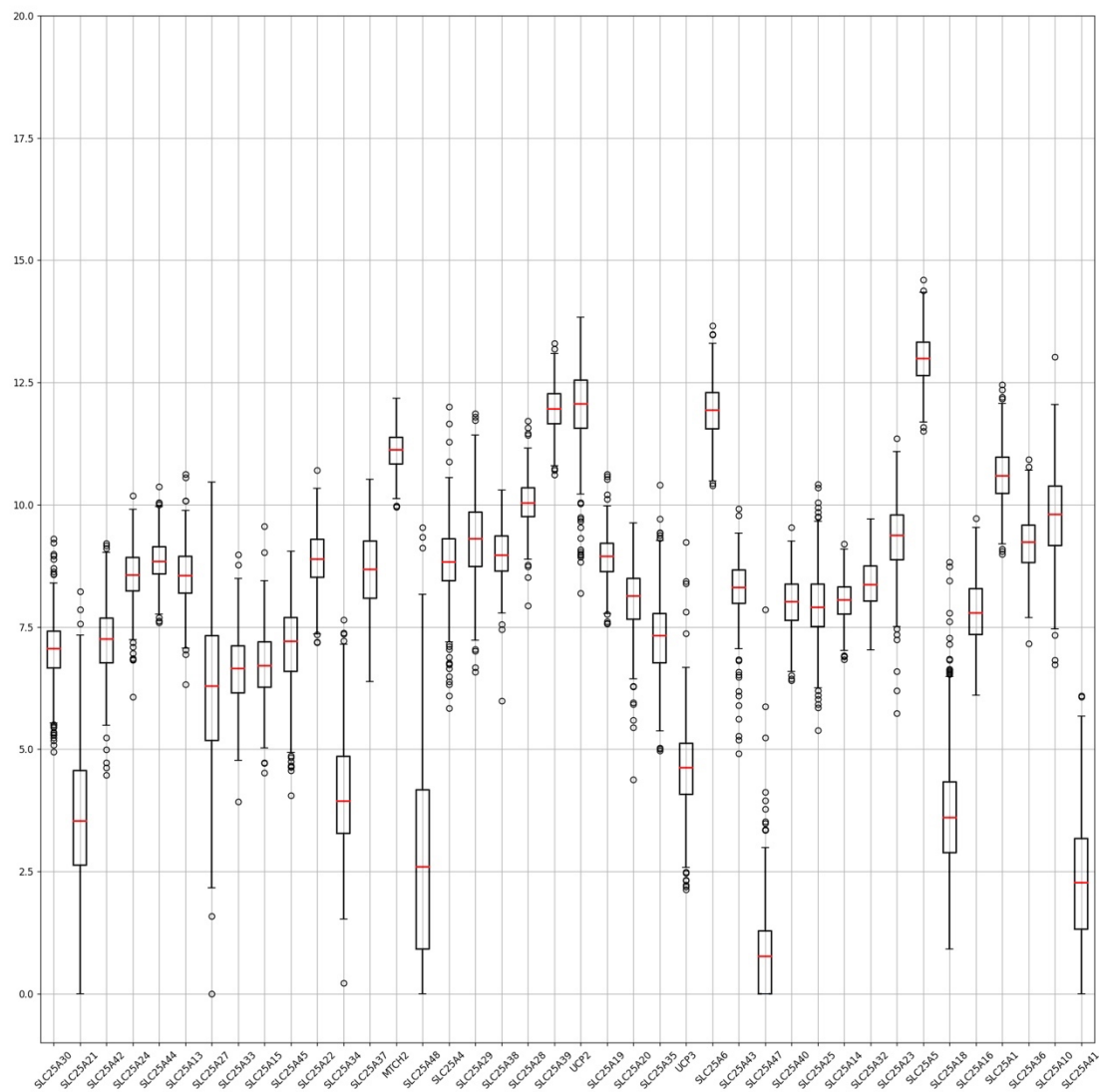


Figure S9D.

Boxplot of SLC25 transporter expression cluster 3 of TCGA tumors (log₂FPKM)

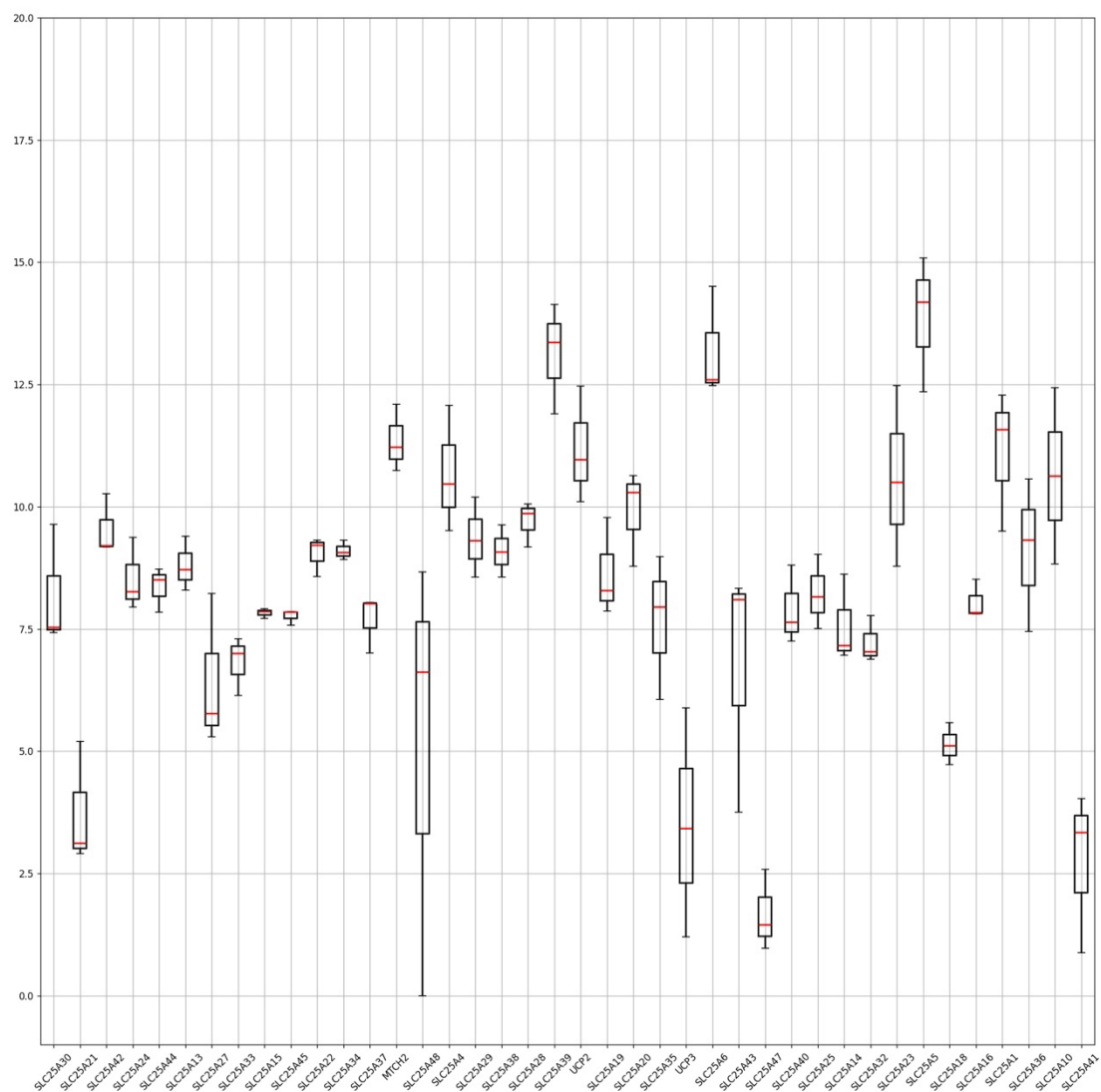


Figure S9E.

Boxplot of SLC25 transporter expression cluster 4 of TCGA tumors (log₂FPKM)

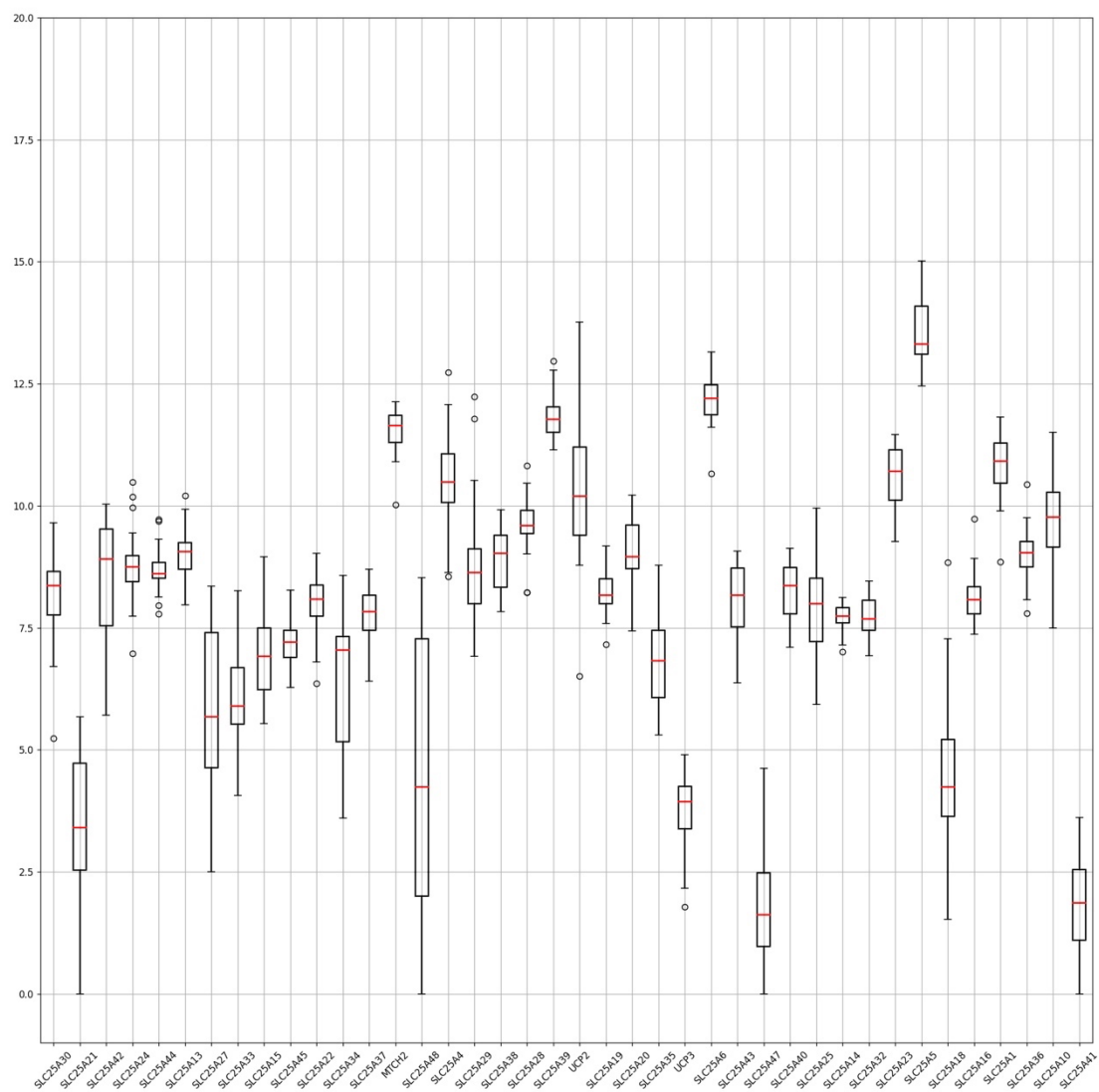
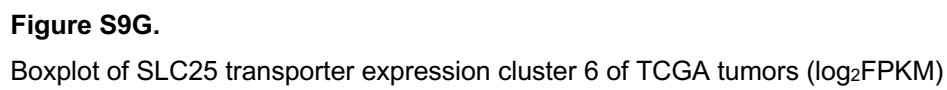


Figure S9F.

Boxplot of SLC25 transporter expression cluster 5 of TCGA tumors (log₂FPKM)



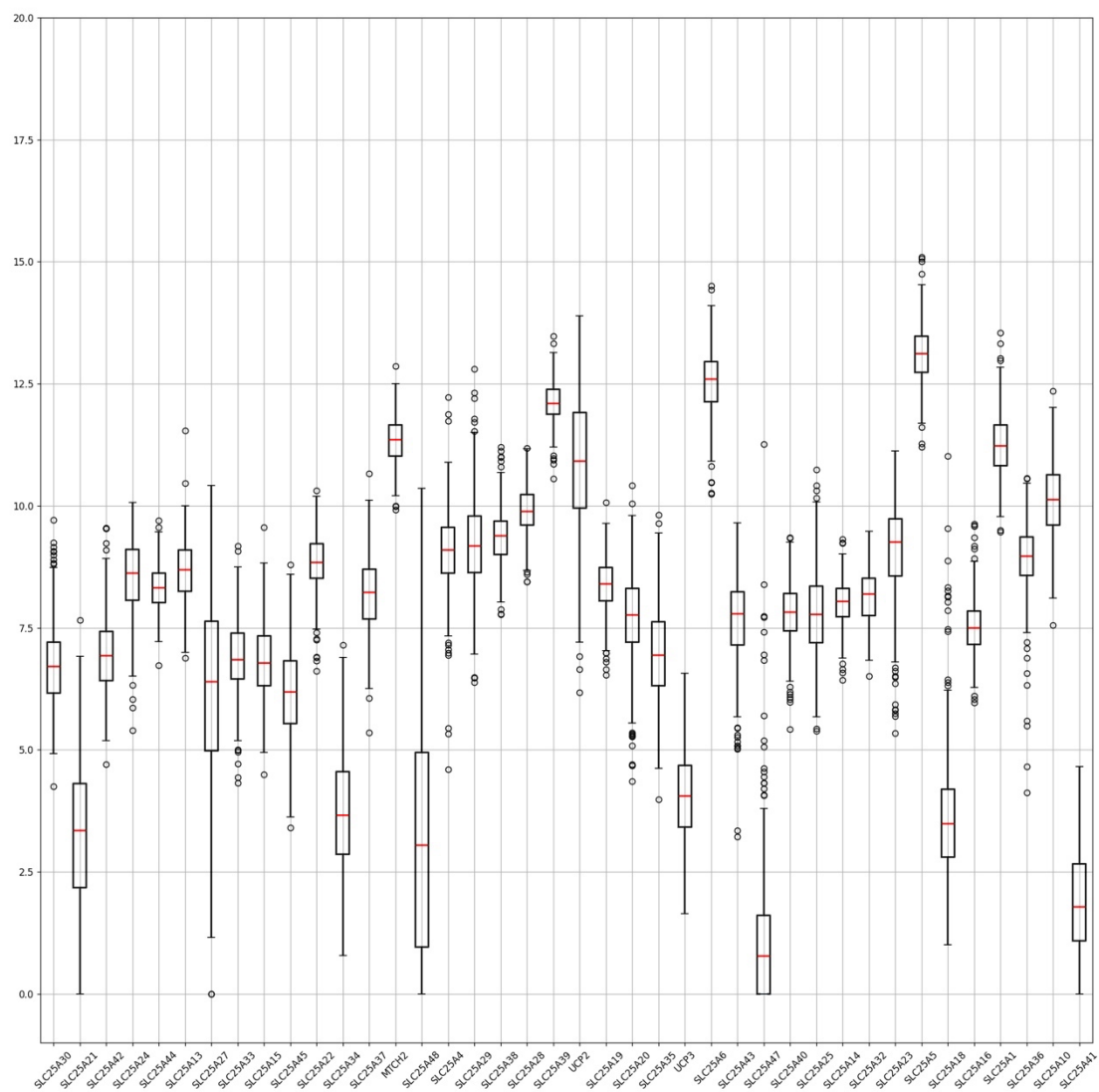


Figure S9H.

Boxplot of SLC25 transporter expression cluster 7 of TCGA tumors (log₂FPKM)

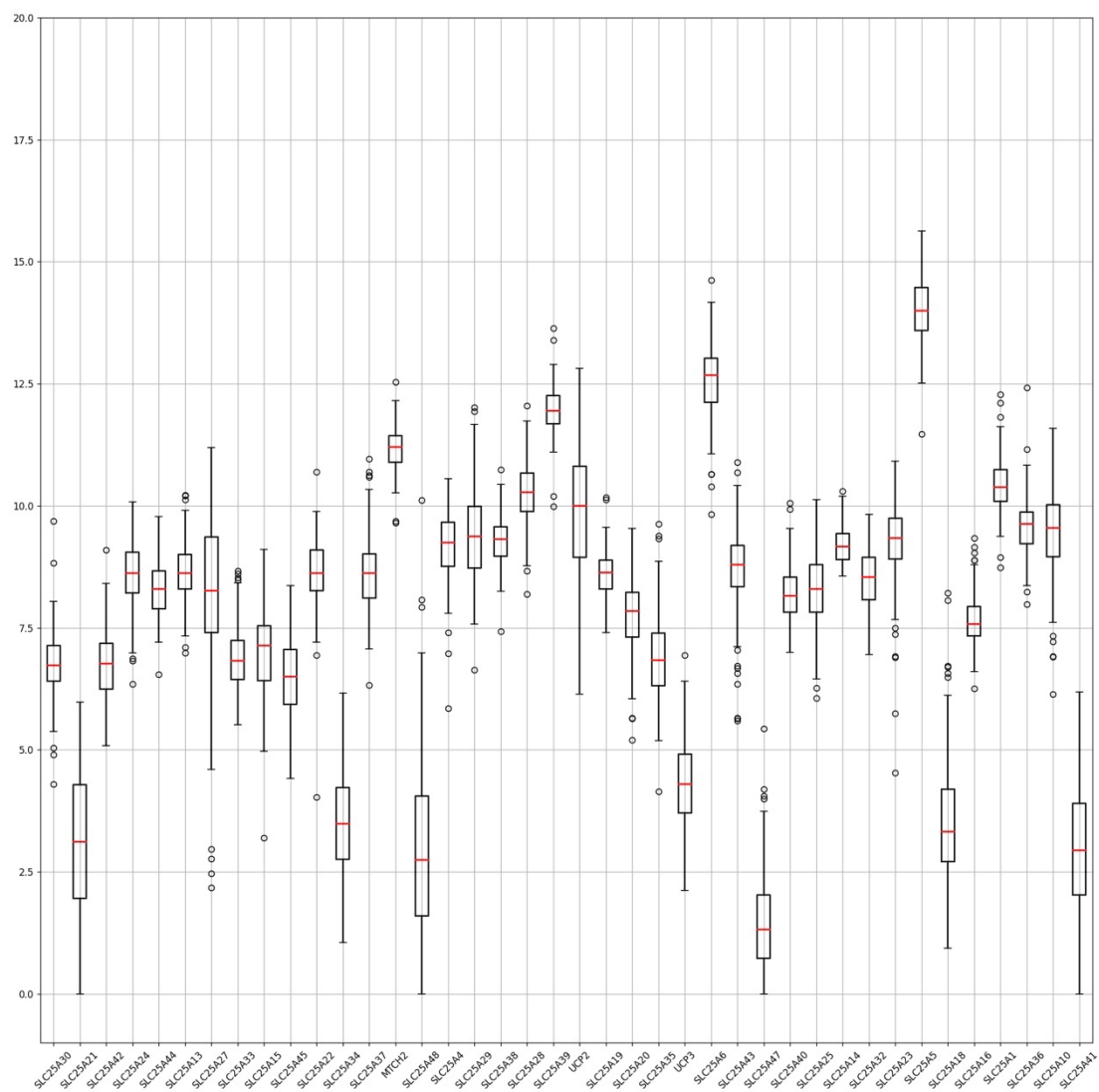


Figure S9I.

Boxplot of SLC25 transporter expression cluster 8 of TCGA tumors (log₂FPKM)

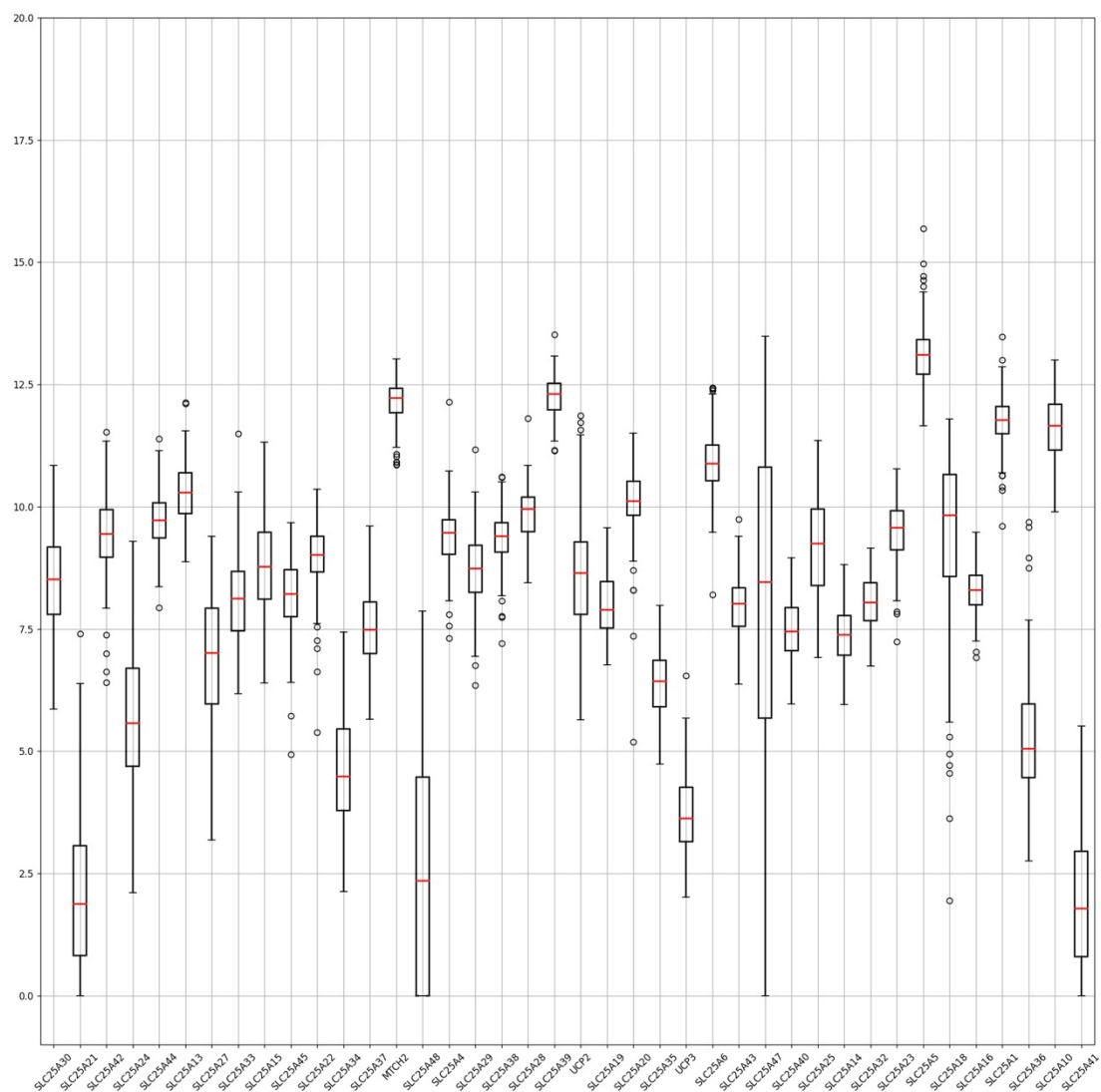
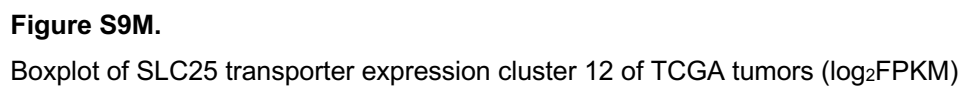
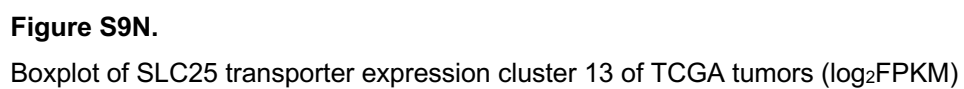


Figure S9L.

Boxplot of SLC25 transporter expression cluster 11 of TCGA tumors (log₂FPKM)





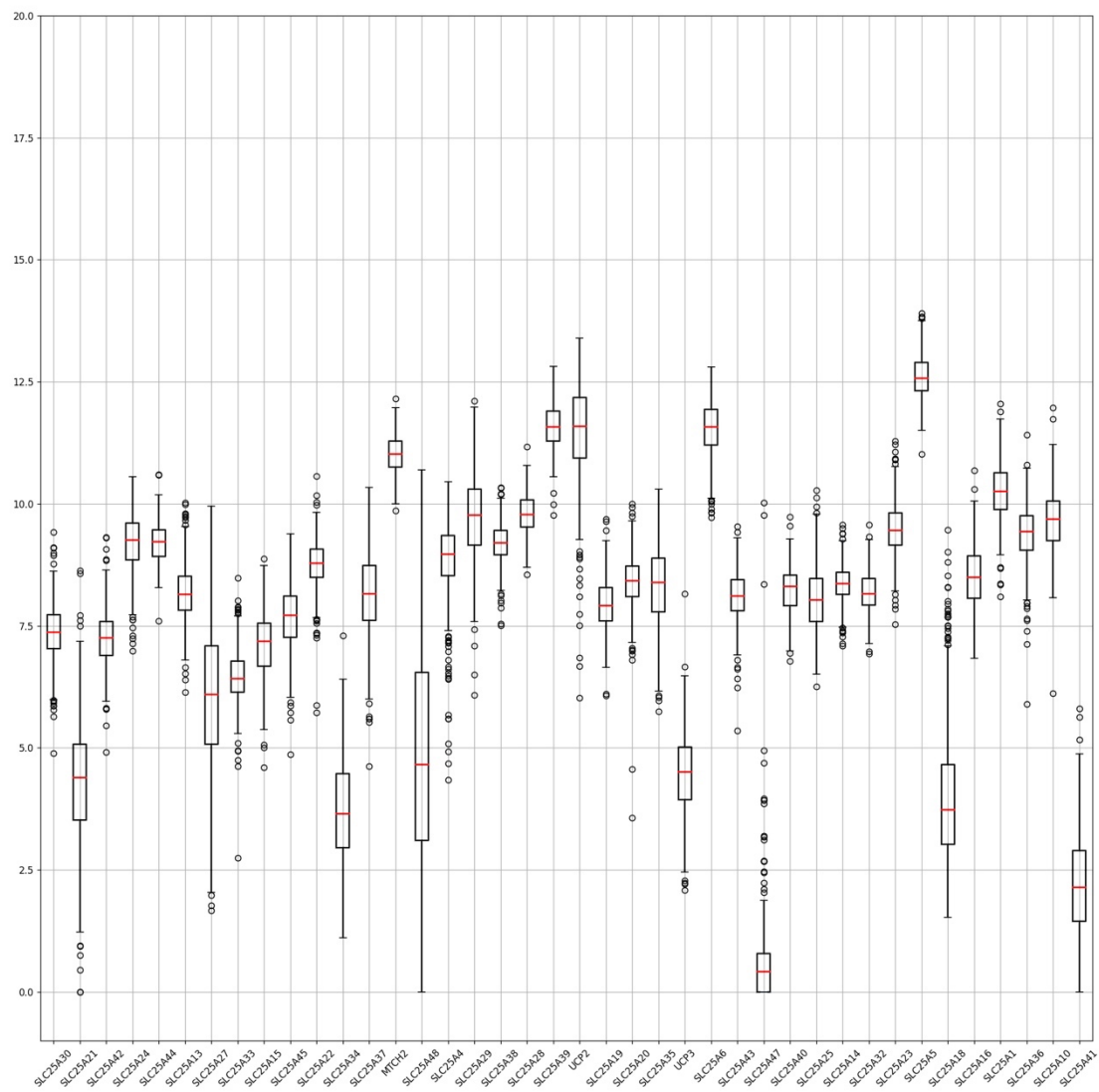
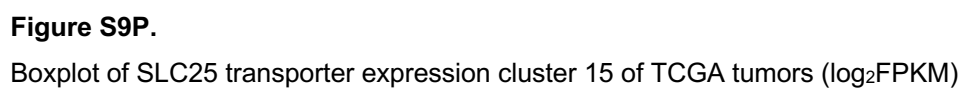


Figure S90.
Boxplot of SLC25 transporter expression cluster 14 of TCGA tumors (log₂FPKM)



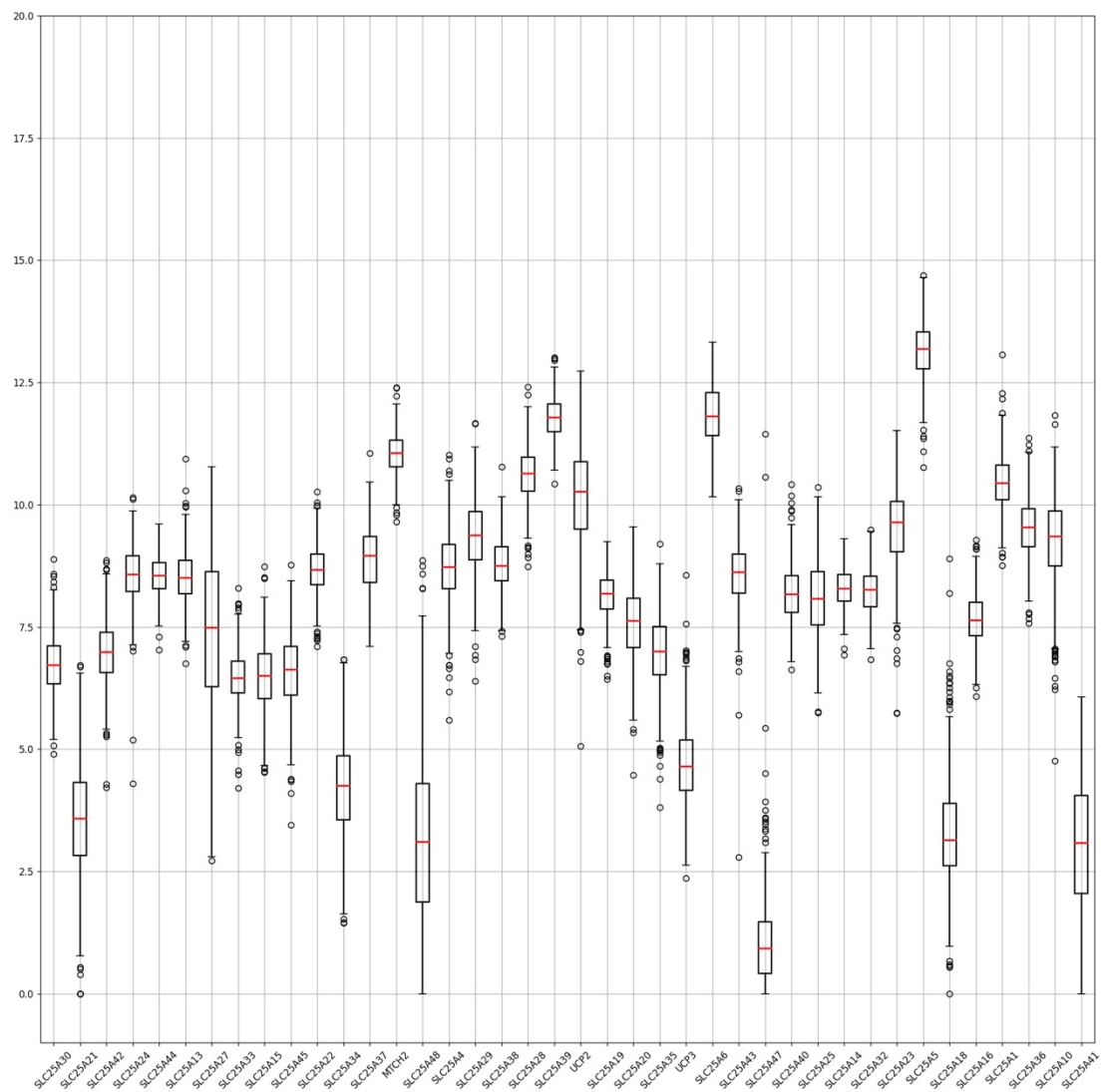


Figure S9U.

Boxplot of SLC25 transporter expression cluster 21 of TCGA tumors ($\log_2\text{FPKM}$)

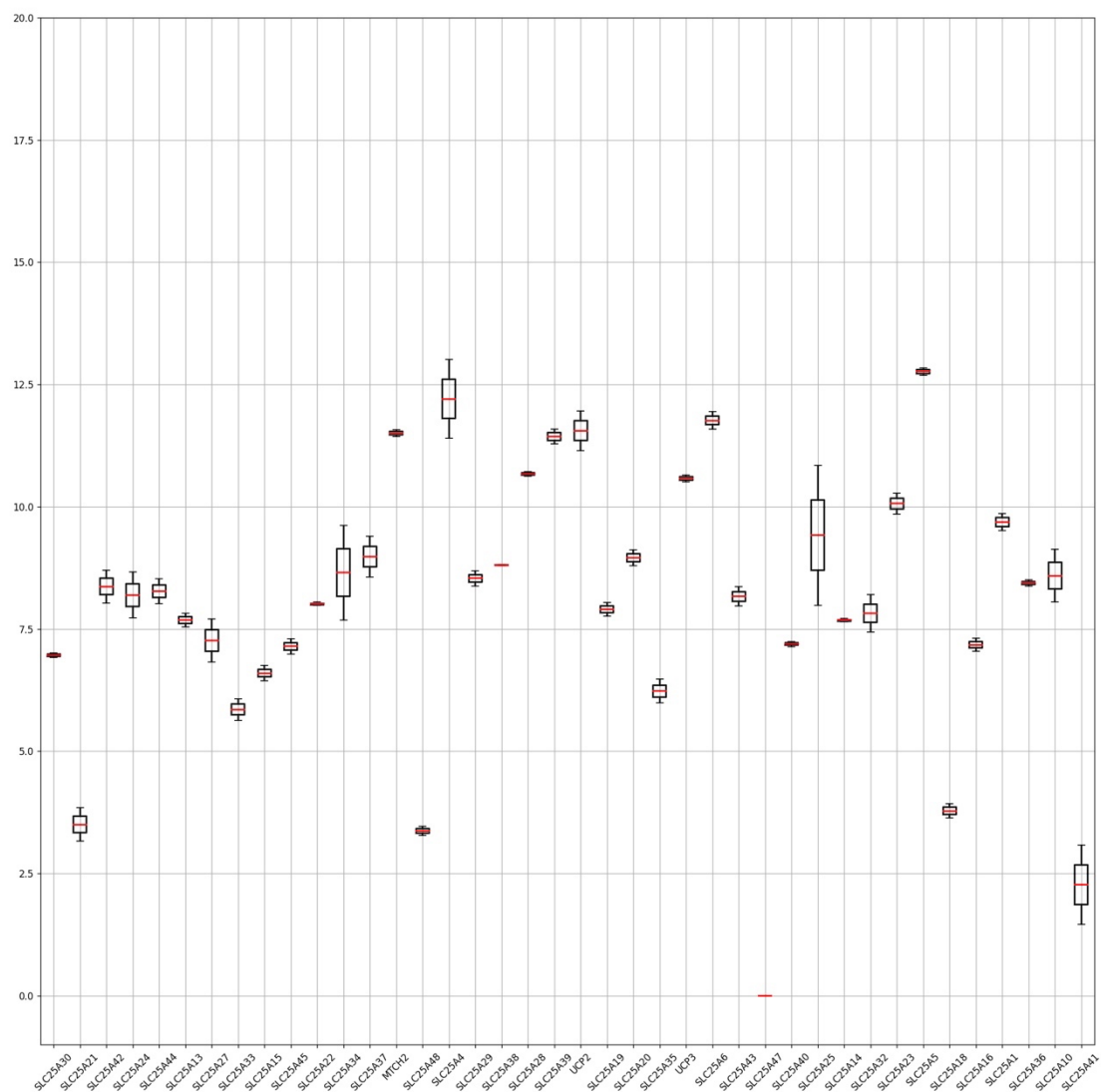


Figure S9V.
Boxplot of SLC25 transporter expression cluster 22 of TCGA tumors (log₂FPKM)

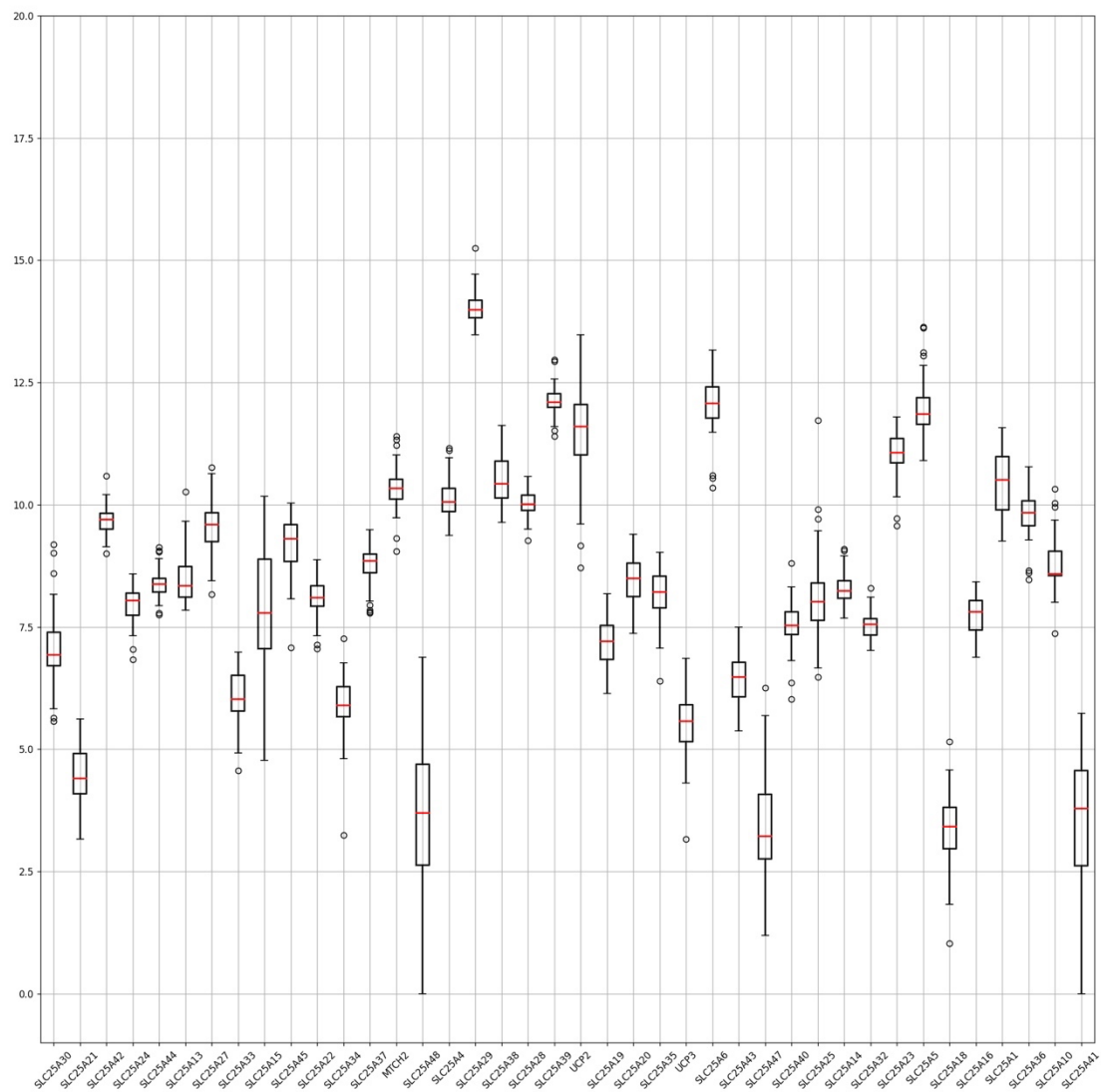


Figure S9Z.

Boxplot of SLC25 transporter expression cluster 26 of TCGA tumors (log₂FPKM)

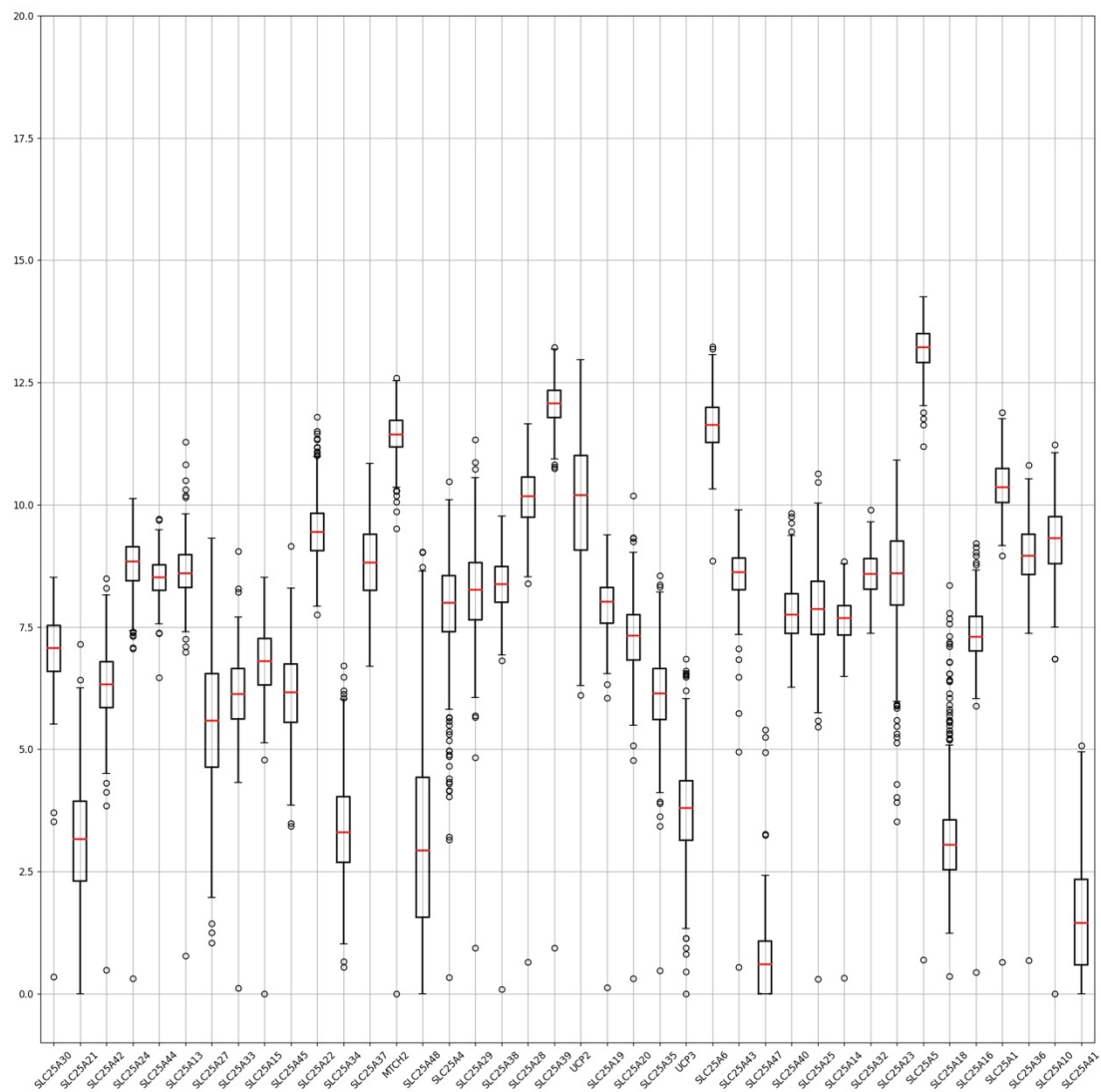


Figure S9AB.

Boxplot of SLC25 transporter expression cluster 31 of TCGA tumors (log₂FPKM)

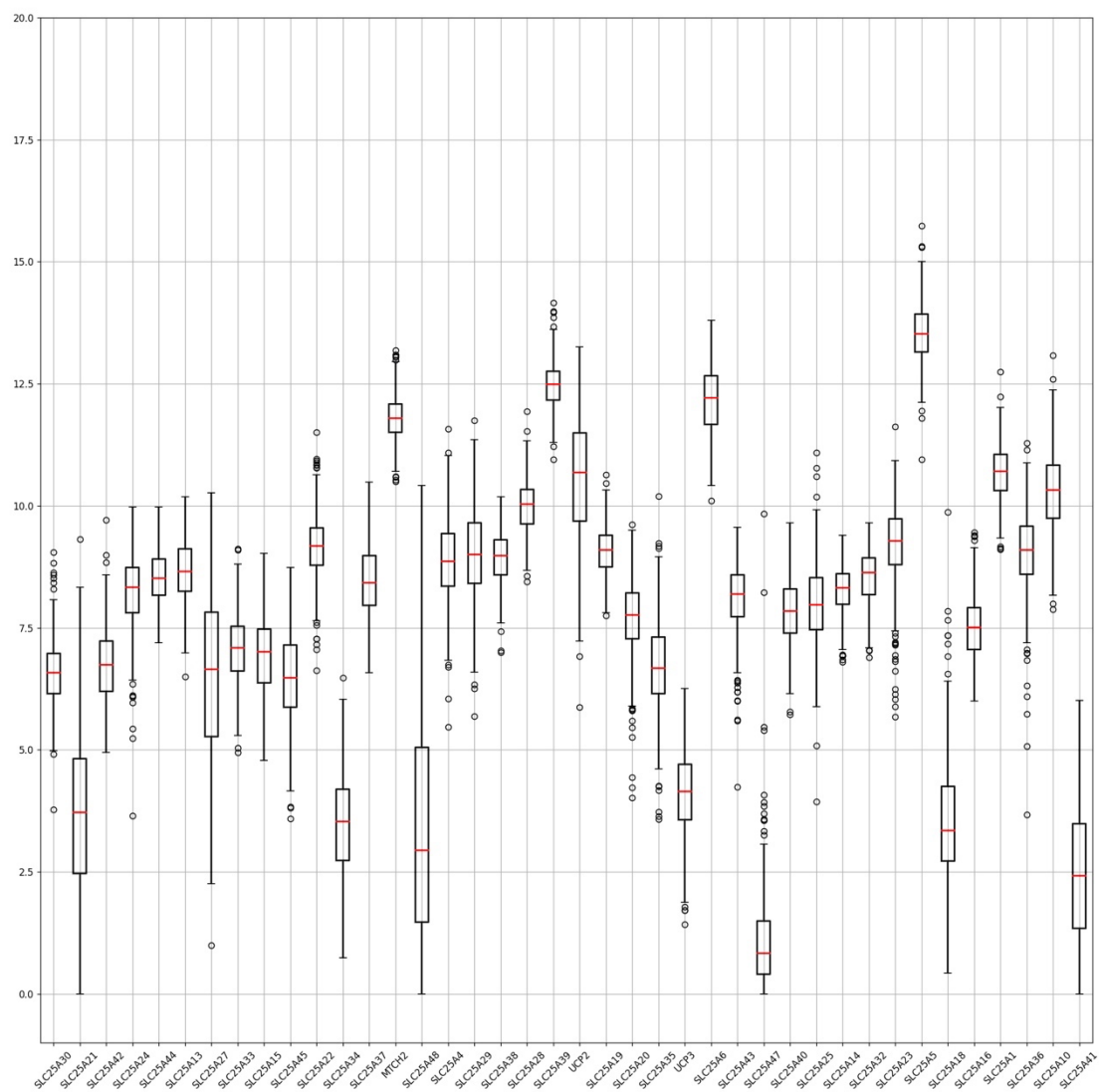


Figure S9AC.

Boxplot of SLC25 transporter expression cluster 32 of TCGA tumors (log₂FPKM)

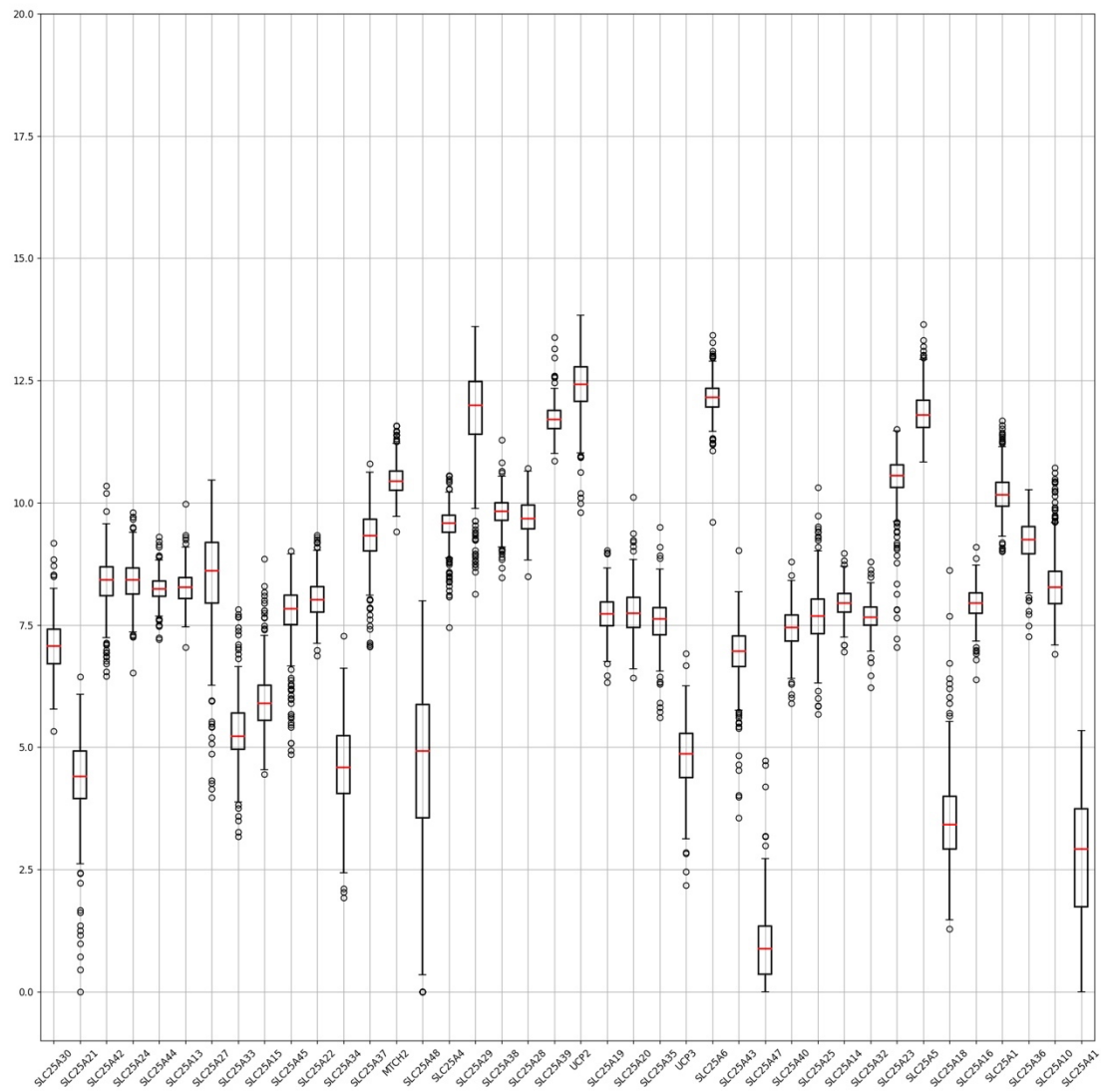
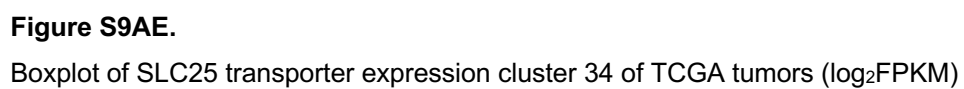
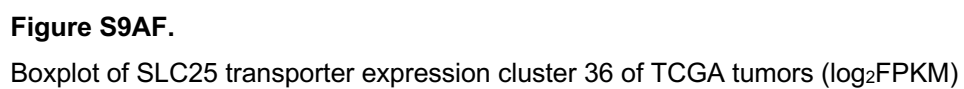
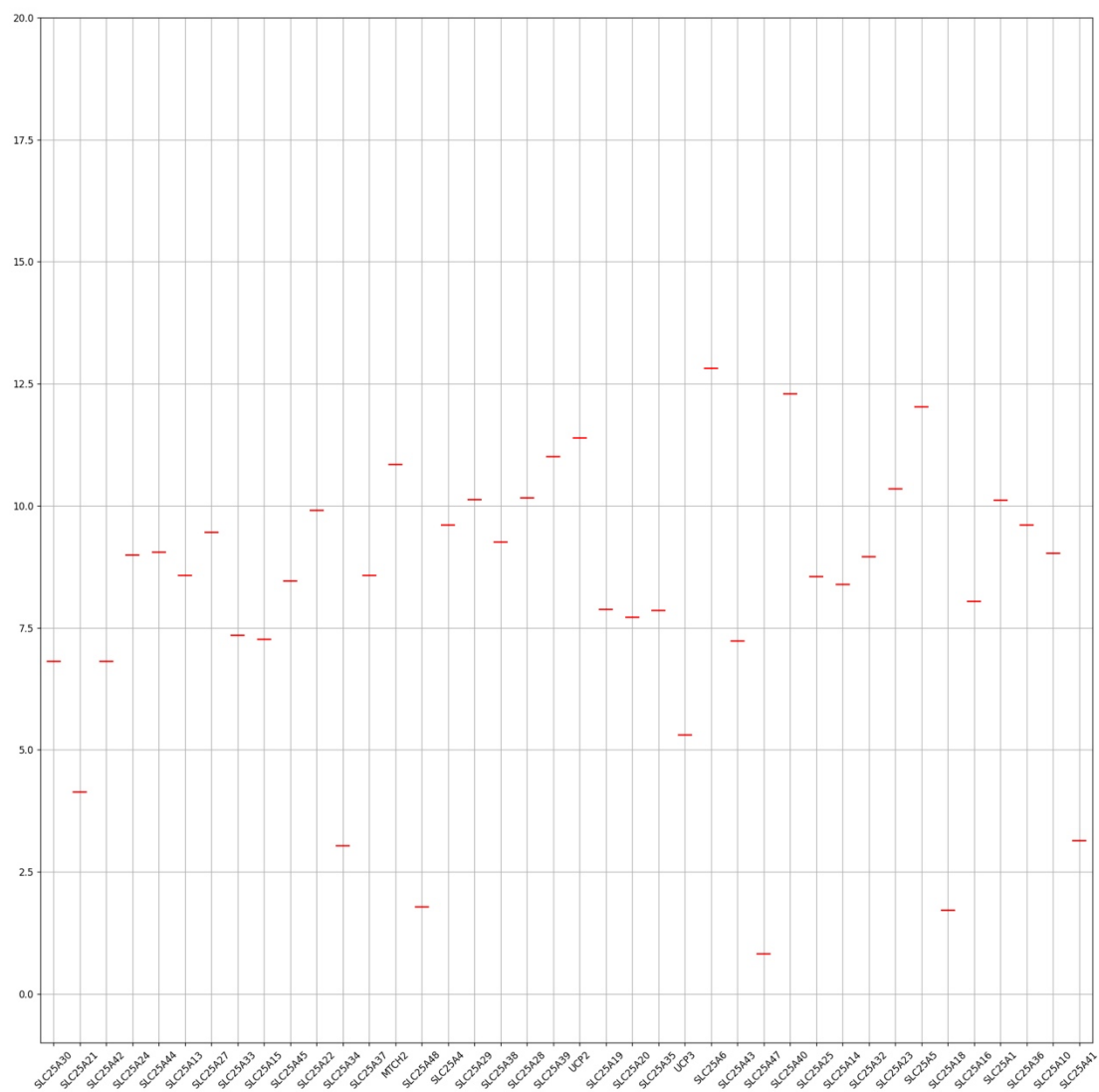


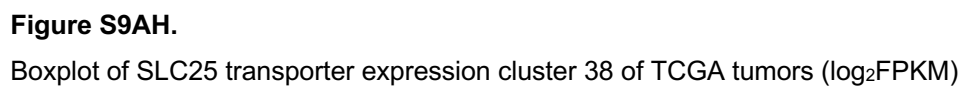
Figure S9AD.

Boxplot of SLC25 transporter expression cluster 33 of TCGA tumors (log₂FPKM)









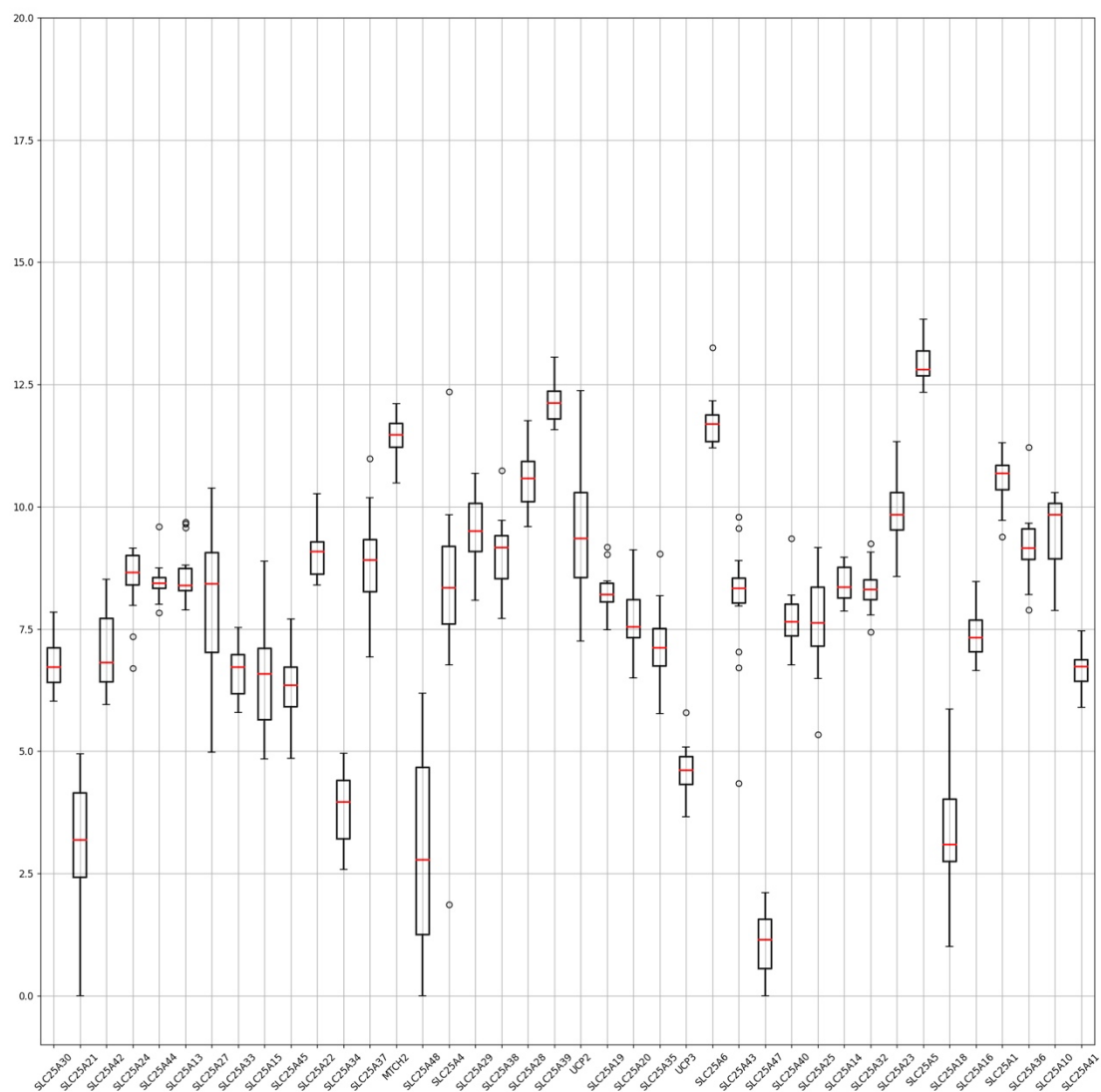
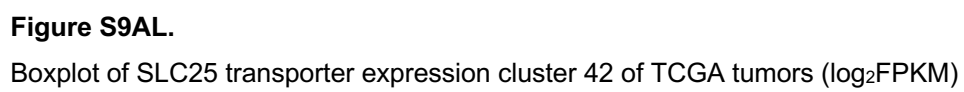


Figure S9AJ.

Boxplot of SLC25 transporter expression cluster 40 of TCGA tumors (log₂FPKM)



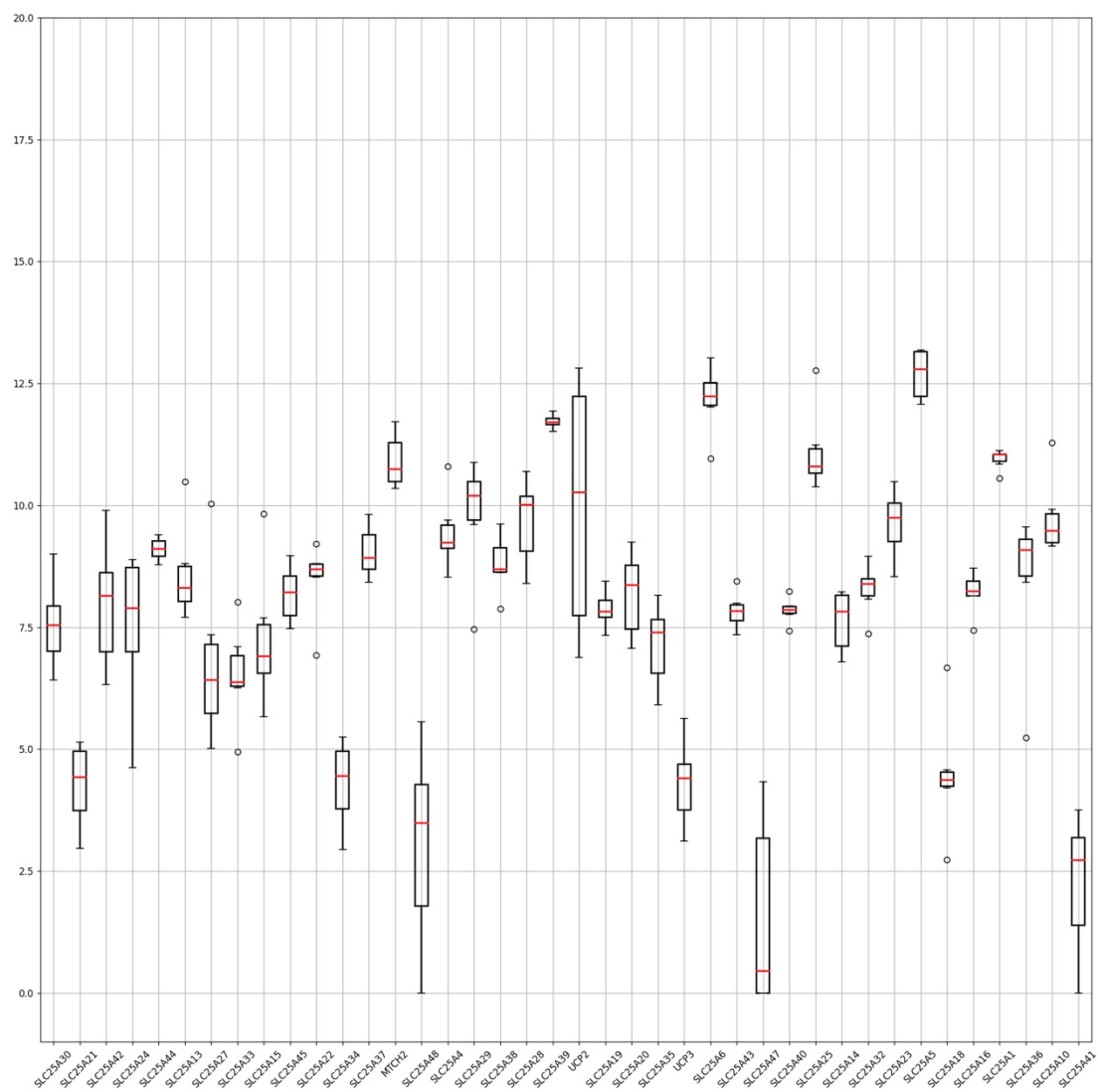


Figure S9AM.

Boxplot of SLC25 transporter expression cluster 43 of TCGA tumors (log₂FPKM)

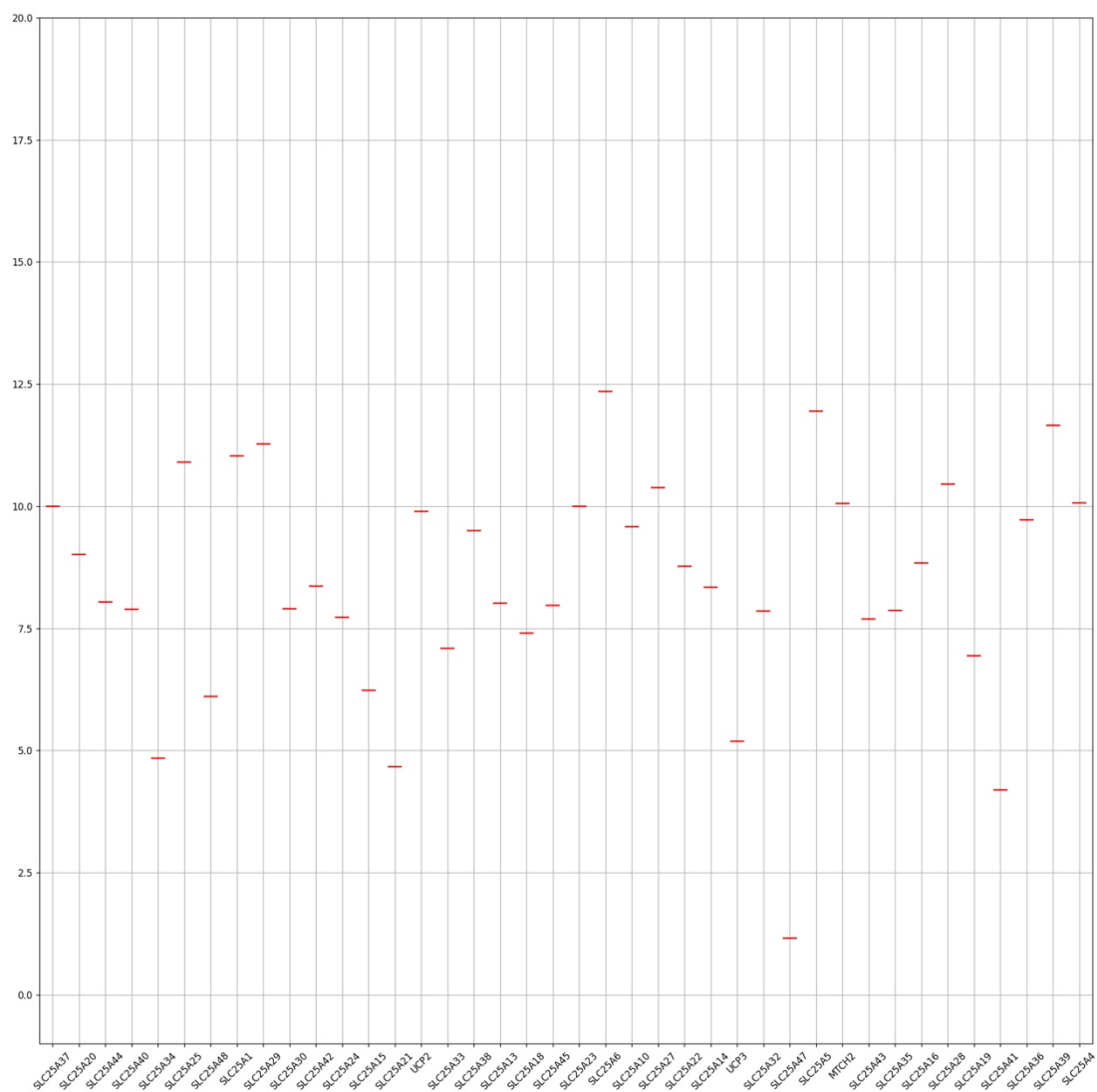


Figure S10A.

Boxplot of SLC25 transporter expression cluster 0 of GTEx normal tissues (log₂FPKM)

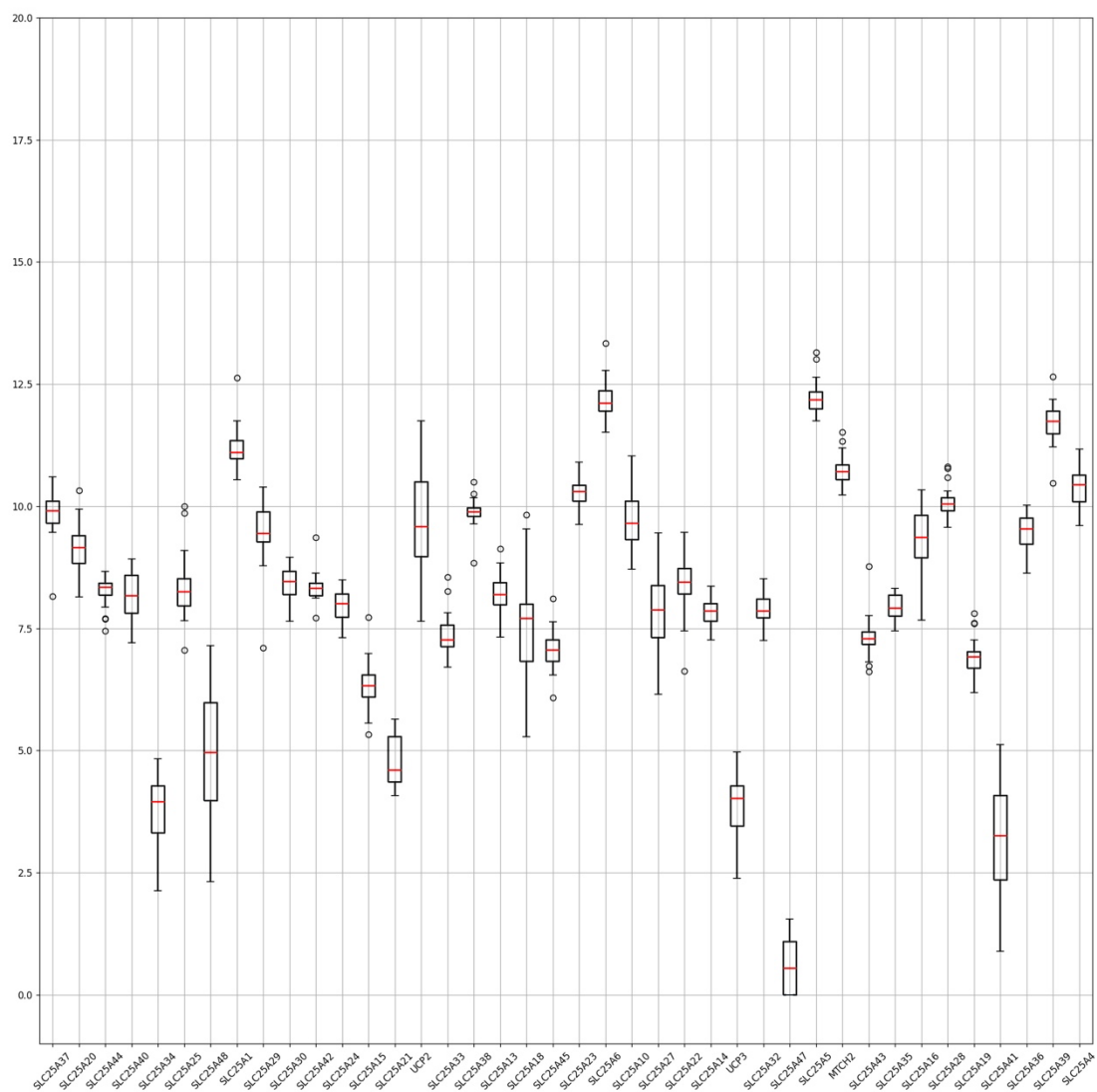


Figure S10B.

Boxplot of SLC25 transporter expression cluster 1 of GTEx normal tissues ($\log_2\text{FPKM}$)

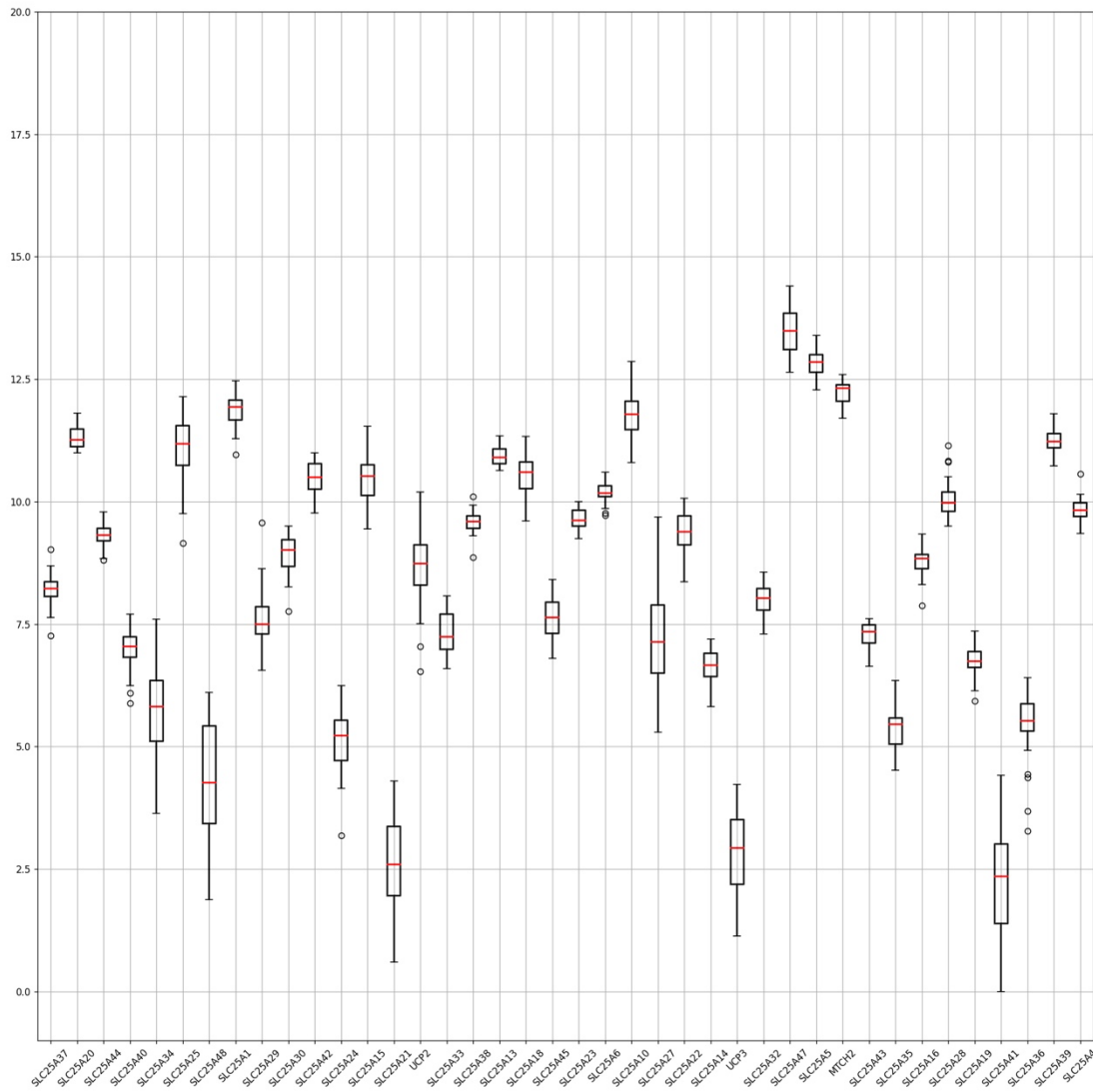


Figure S10C.

Boxplot of SLC25 transporter expression cluster 2 of GTEx normal tissues (log₂FPKM)

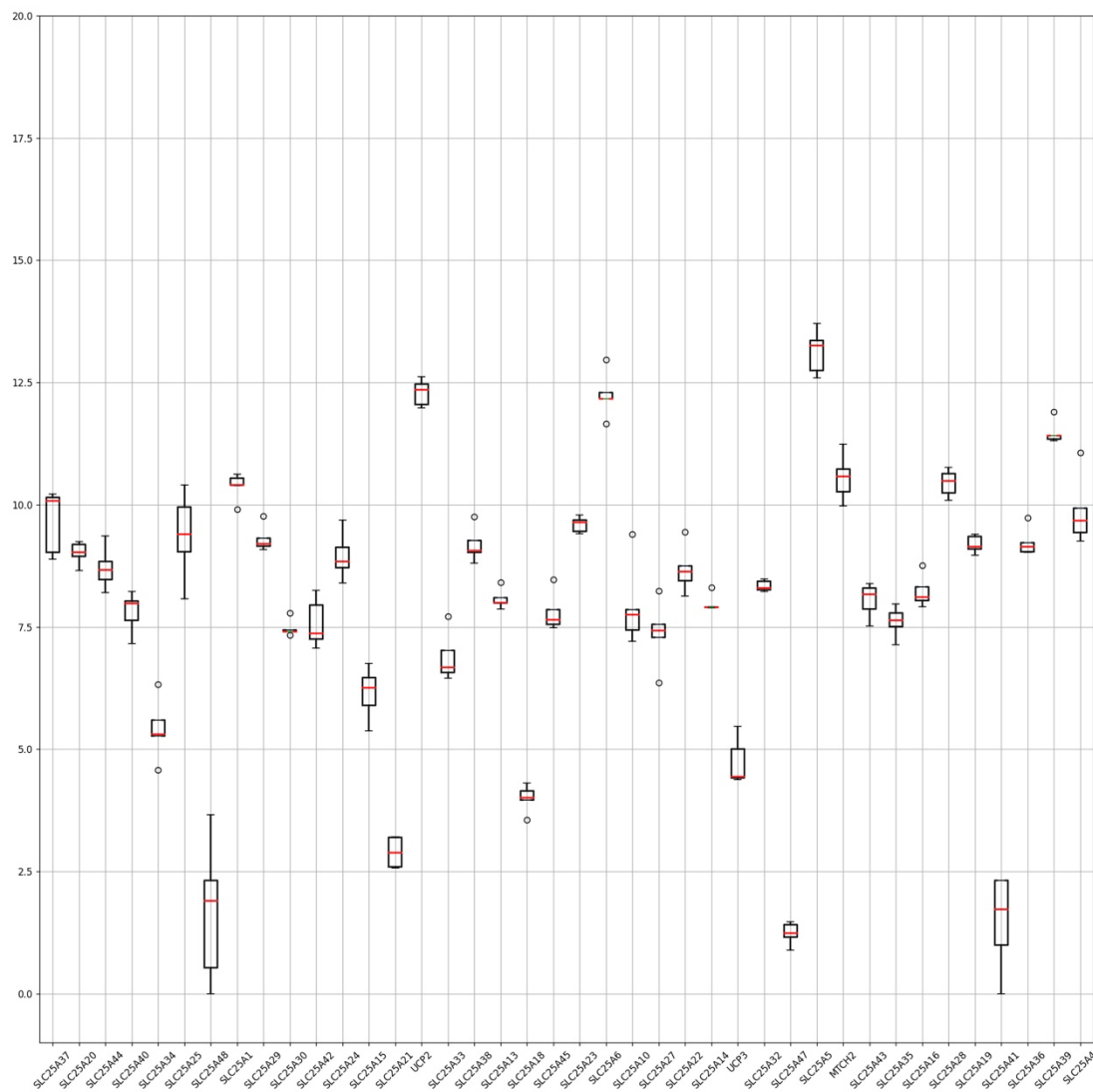


Figure S10D.

Boxplot of SLC25 transporter expression cluster 3 of GTEx normal tissues (log₂FPKM)

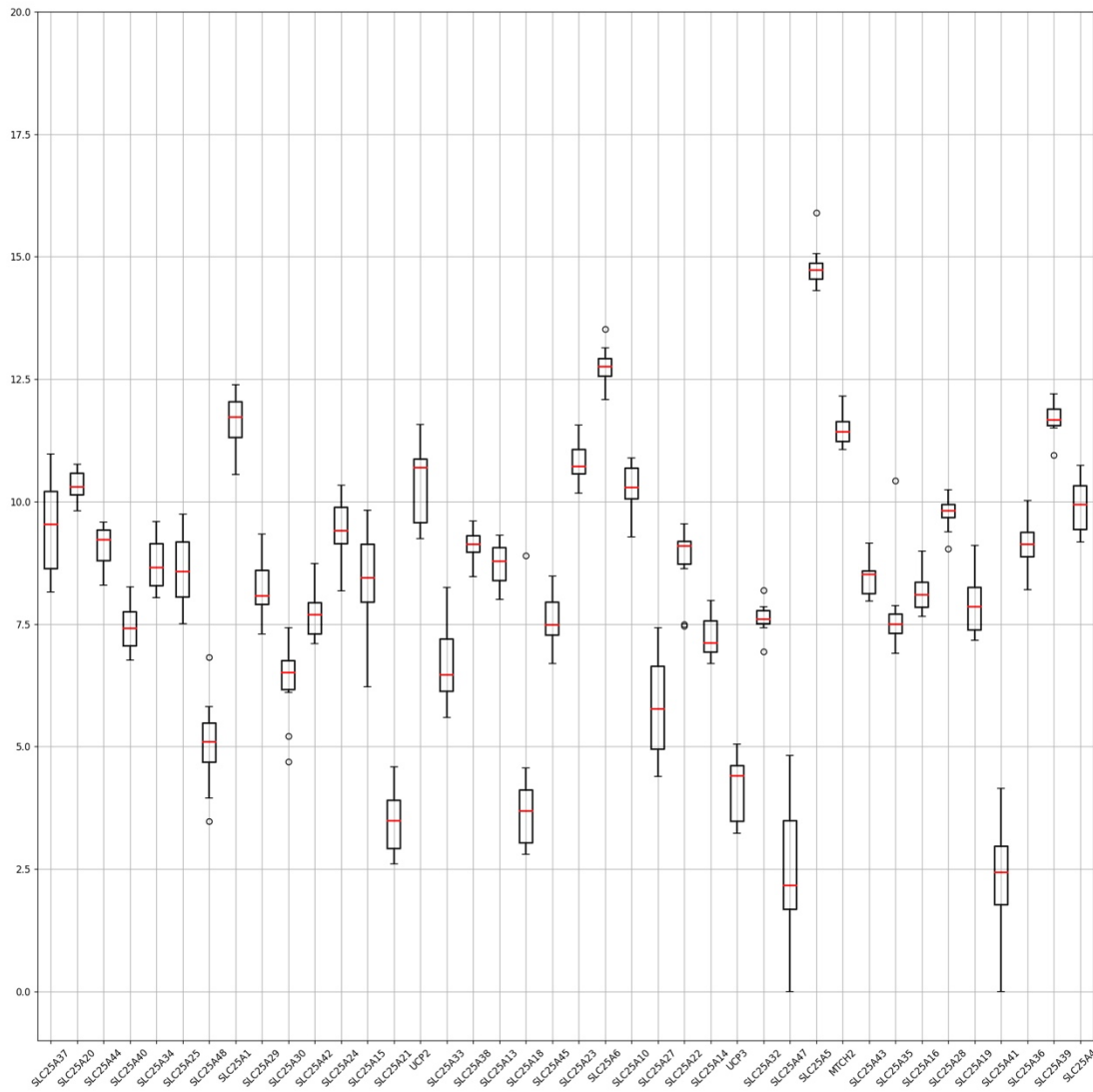


Figure S10E.

Boxplot of SLC25 transporter expression cluster 4 of GTEx normal tissues (log₂FPKM)

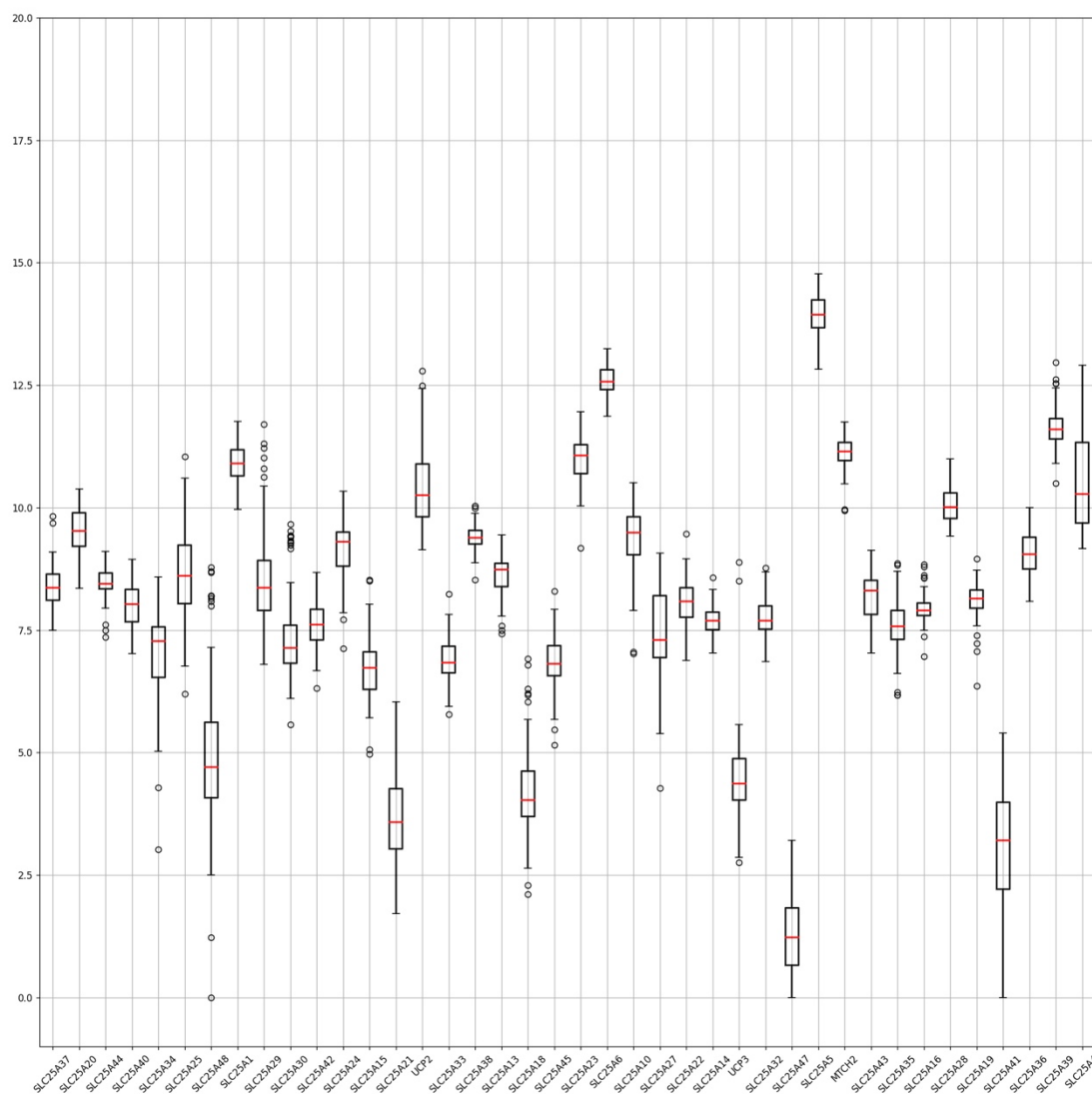


Figure S10F.

Boxplot of SLC25 transporter expression cluster 5 of GTEx normal tissues (log₂FPKM)

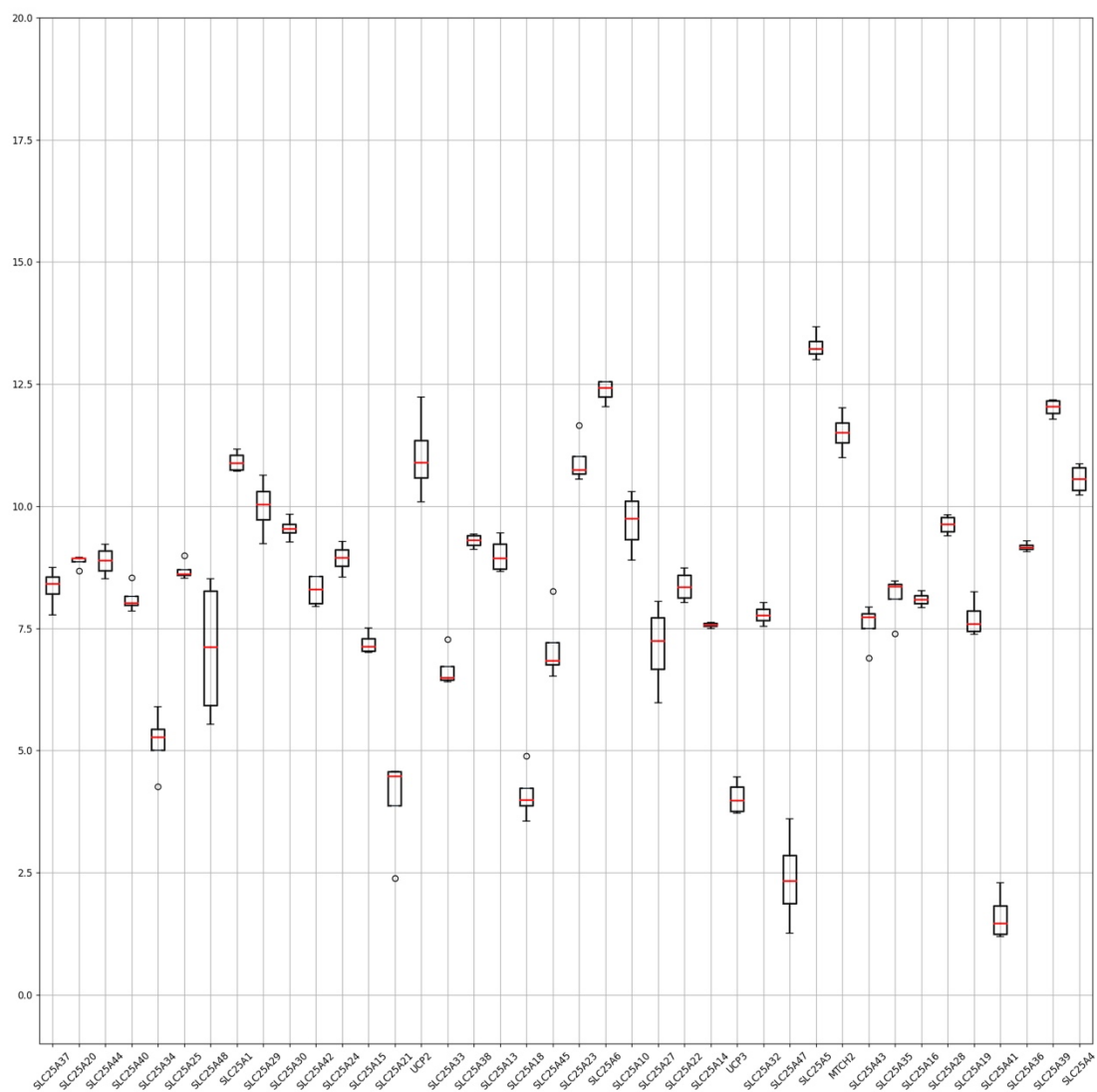


Figure S10G.

Boxplot of SLC25 transporter expression cluster 6 of GTEx normal tissues (log₂FPKM)

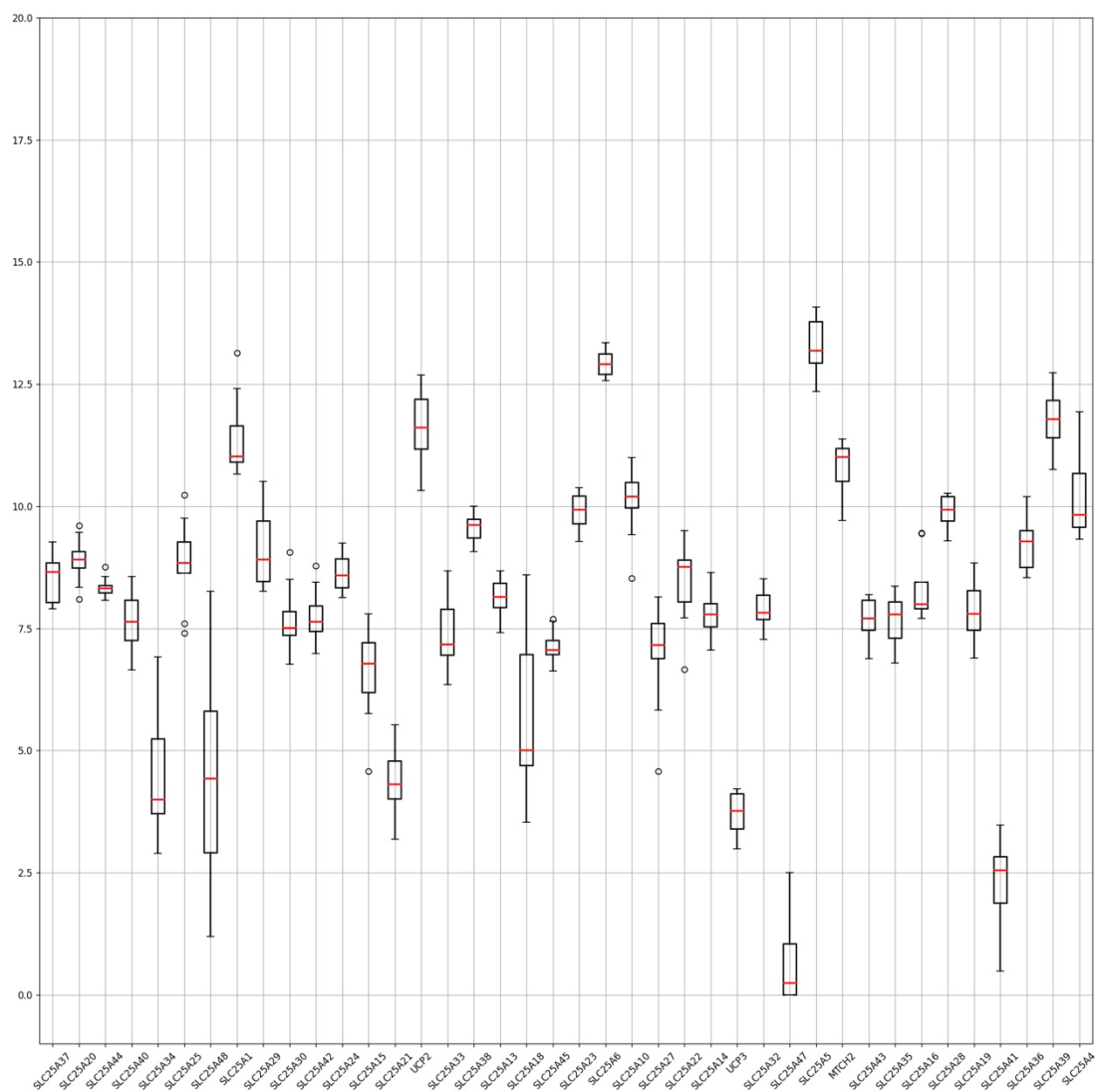


Figure S10H.

Boxplot of SLC25 transporter expression cluster 7 of GTEx normal tissues ($\log_2\text{FPKM}$)

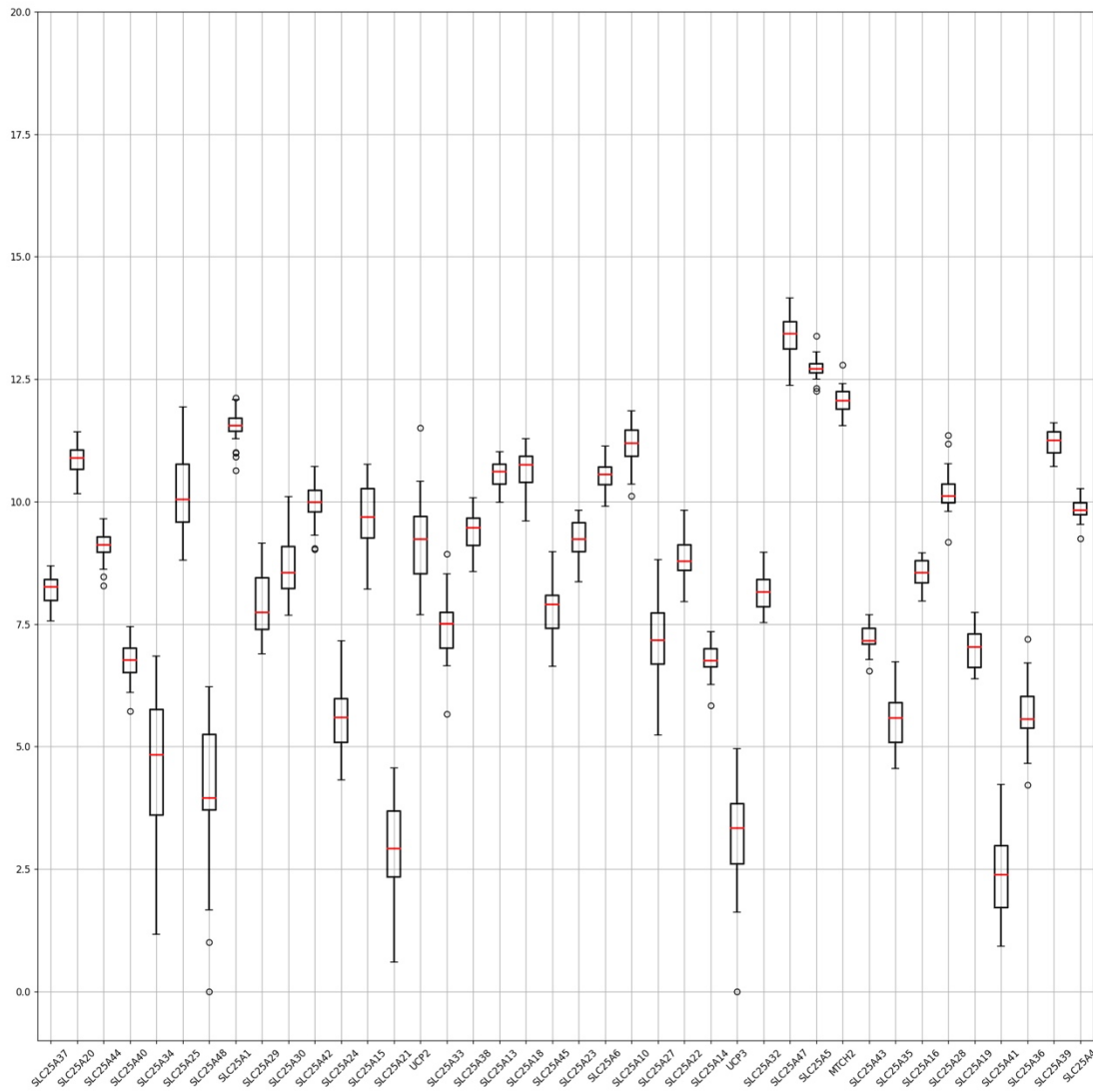


Figure S10I.

Boxplot of SLC25 transporter expression cluster 12 of GTEx normal tissues (log₂FPKM)

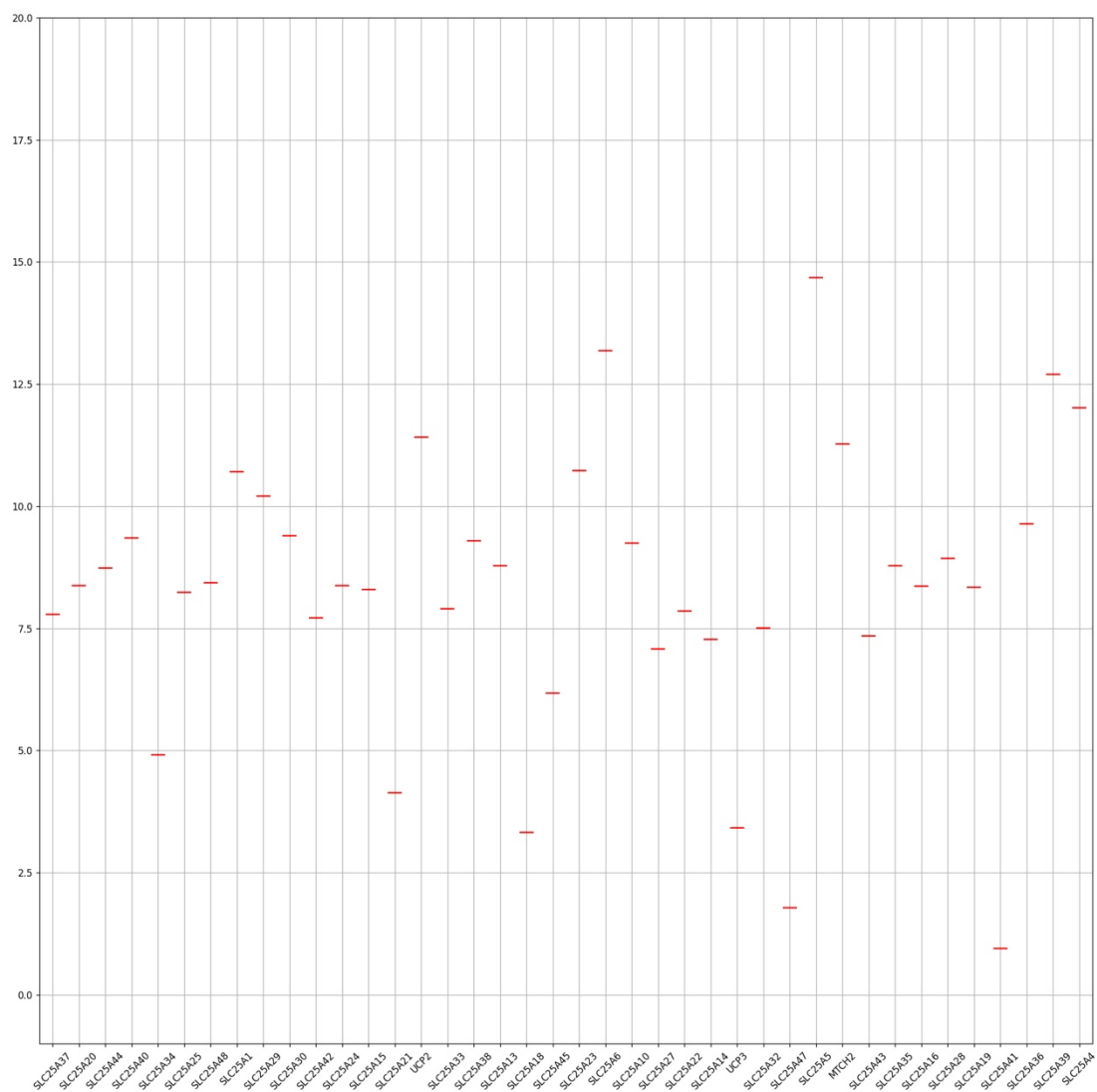


Figure S10J.

Boxplot of SLC25 transporter expression cluster 13 of GTEx normal tissues (log₂FPKM)

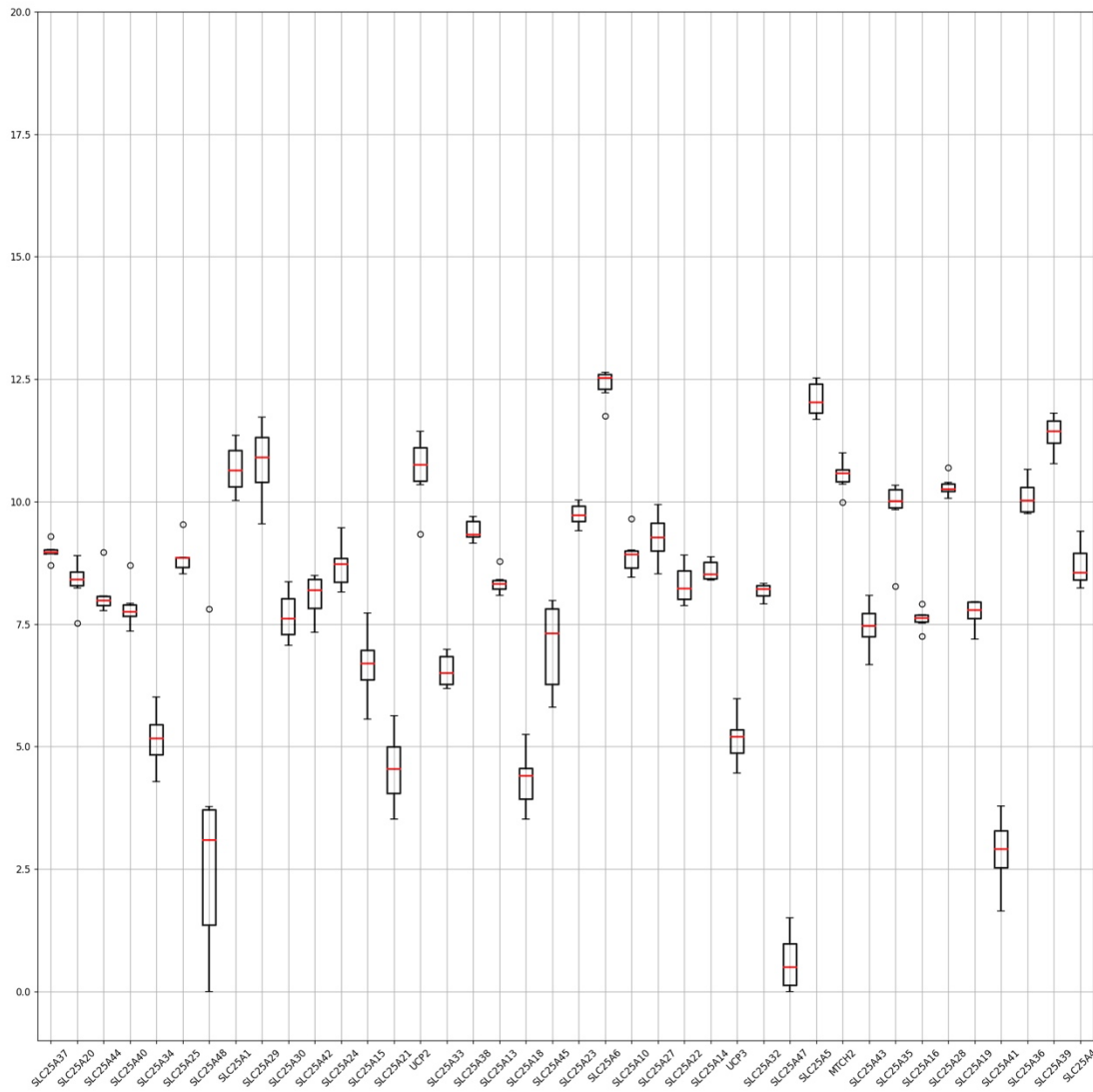


Figure S10K.

Boxplot of SLC25 transporter expression cluster 14 of GTEx normal tissues (log₂FPKM)

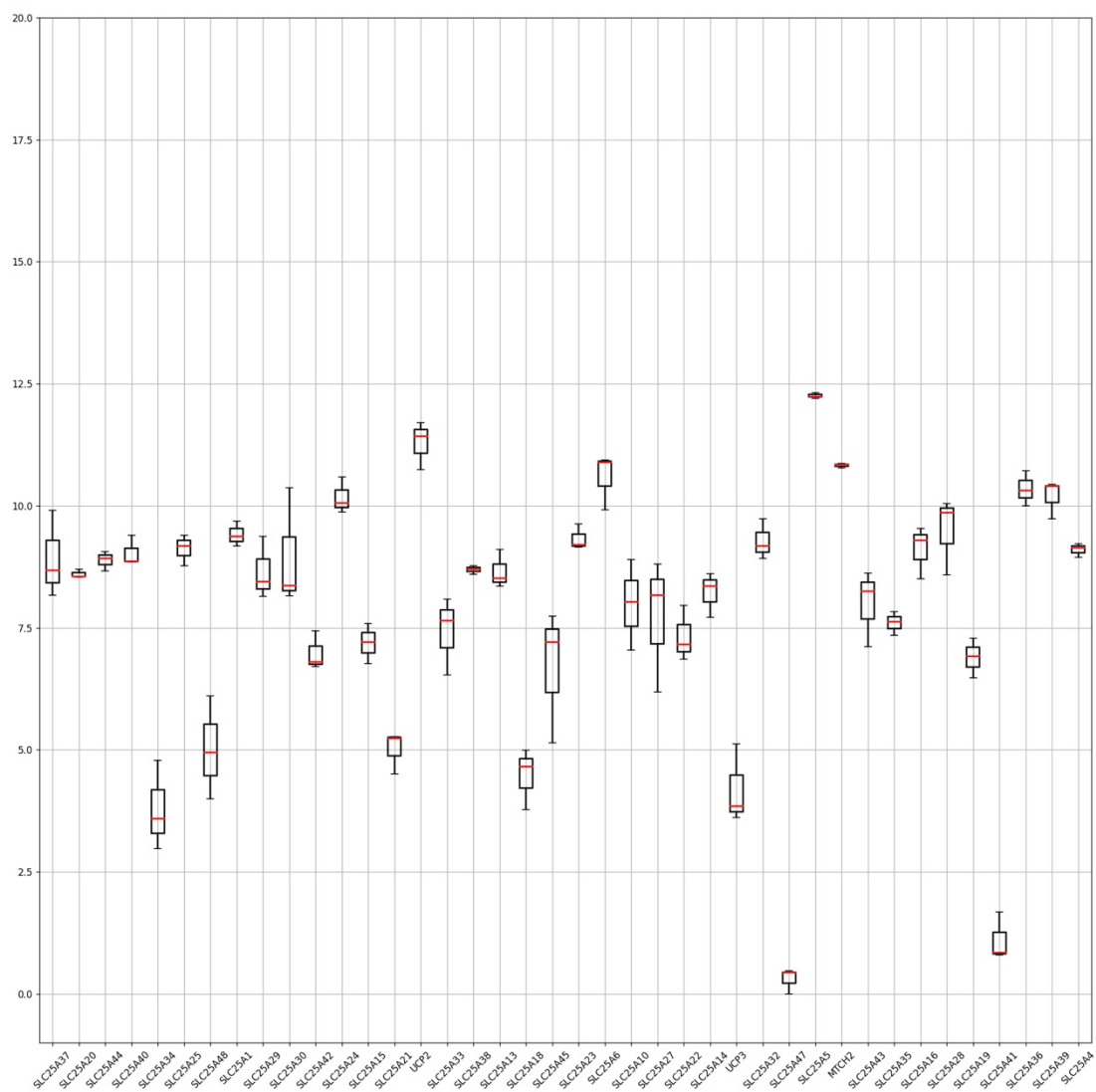


Figure S10L.

Boxplot of SLC25 transporter expression cluster 16 of GTEx normal tissues (log₂FPKM)

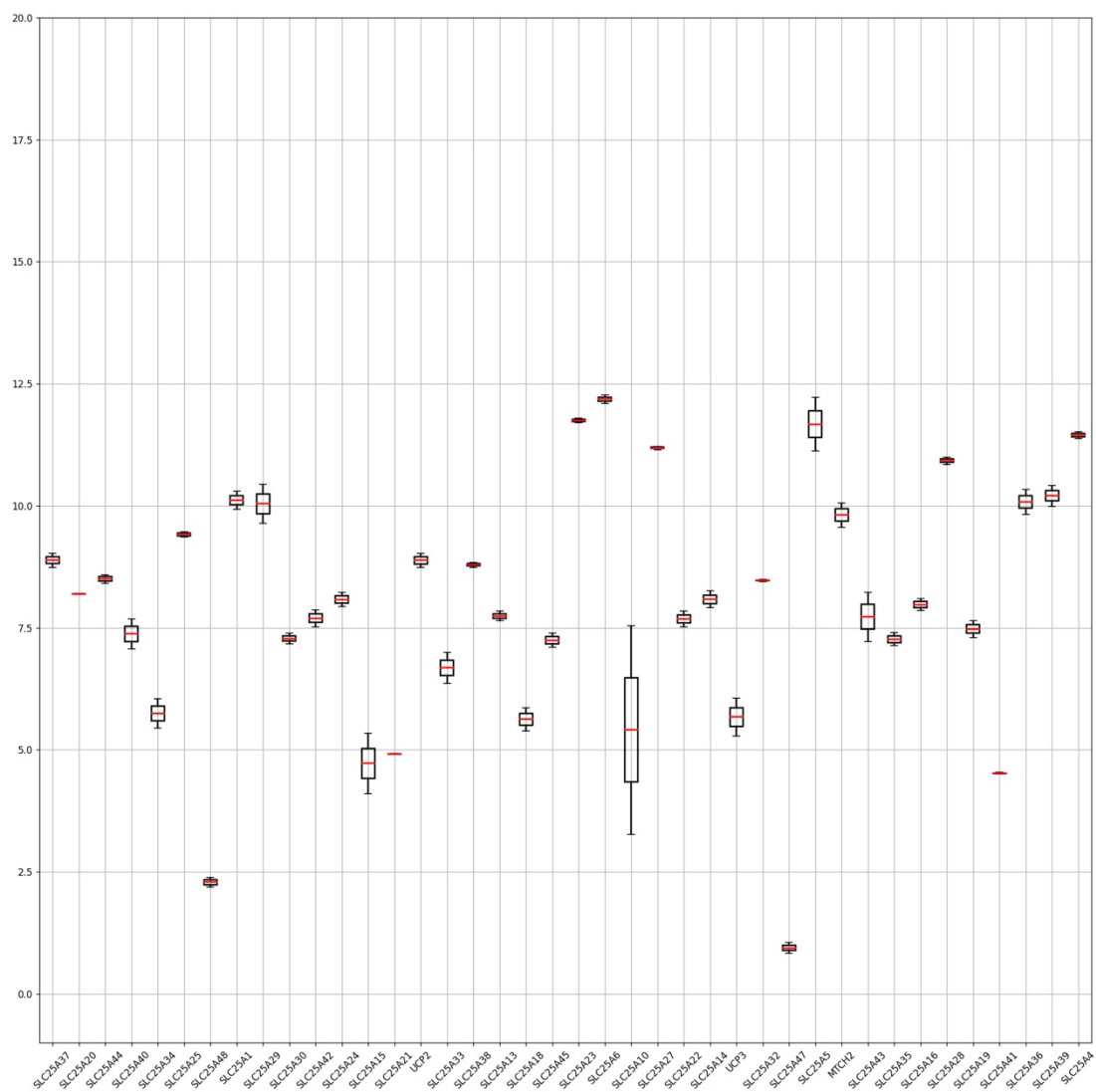


Figure S10M.

Boxplot of SLC25 transporter expression cluster 19 of GTEx normal tissues (log₂FPKM)

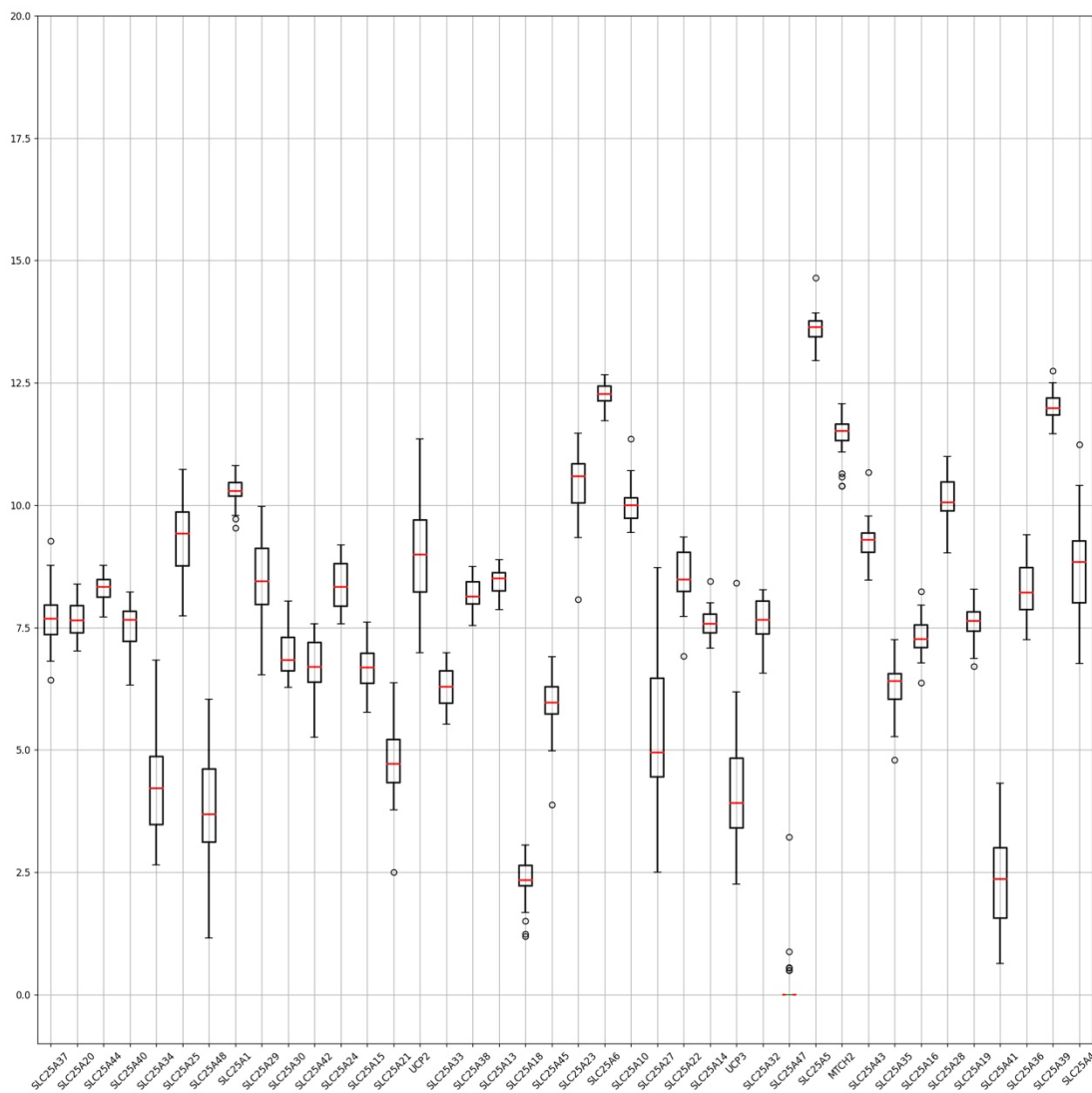


Figure S10N.

Boxplot of SLC25 transporter expression cluster 20 of GTEx normal tissues (log₂FPKM)

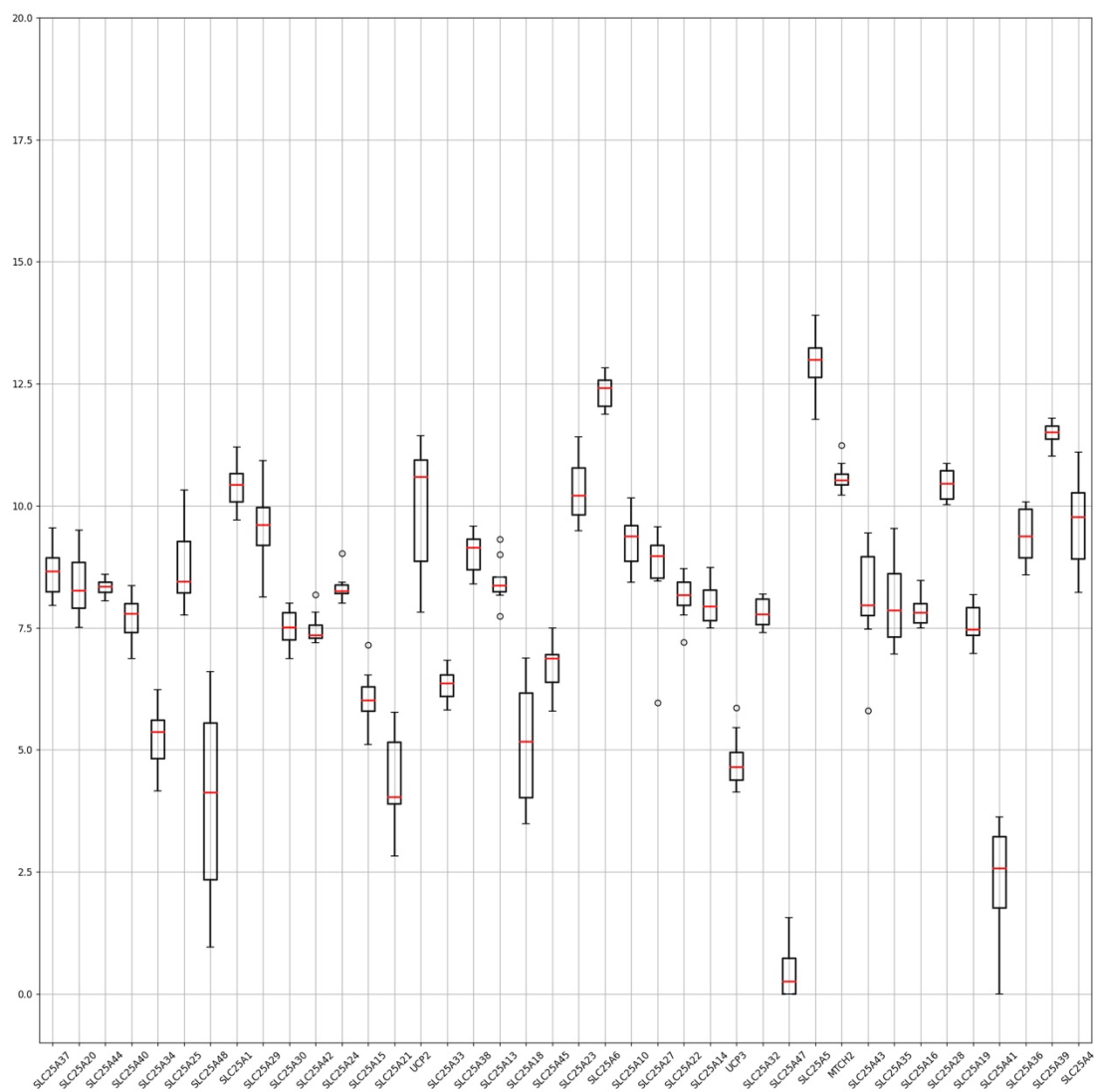


Figure S100.

Boxplot of SLC25 transporter expression cluster 21 of GTEx normal tissues (log₂FPKM)

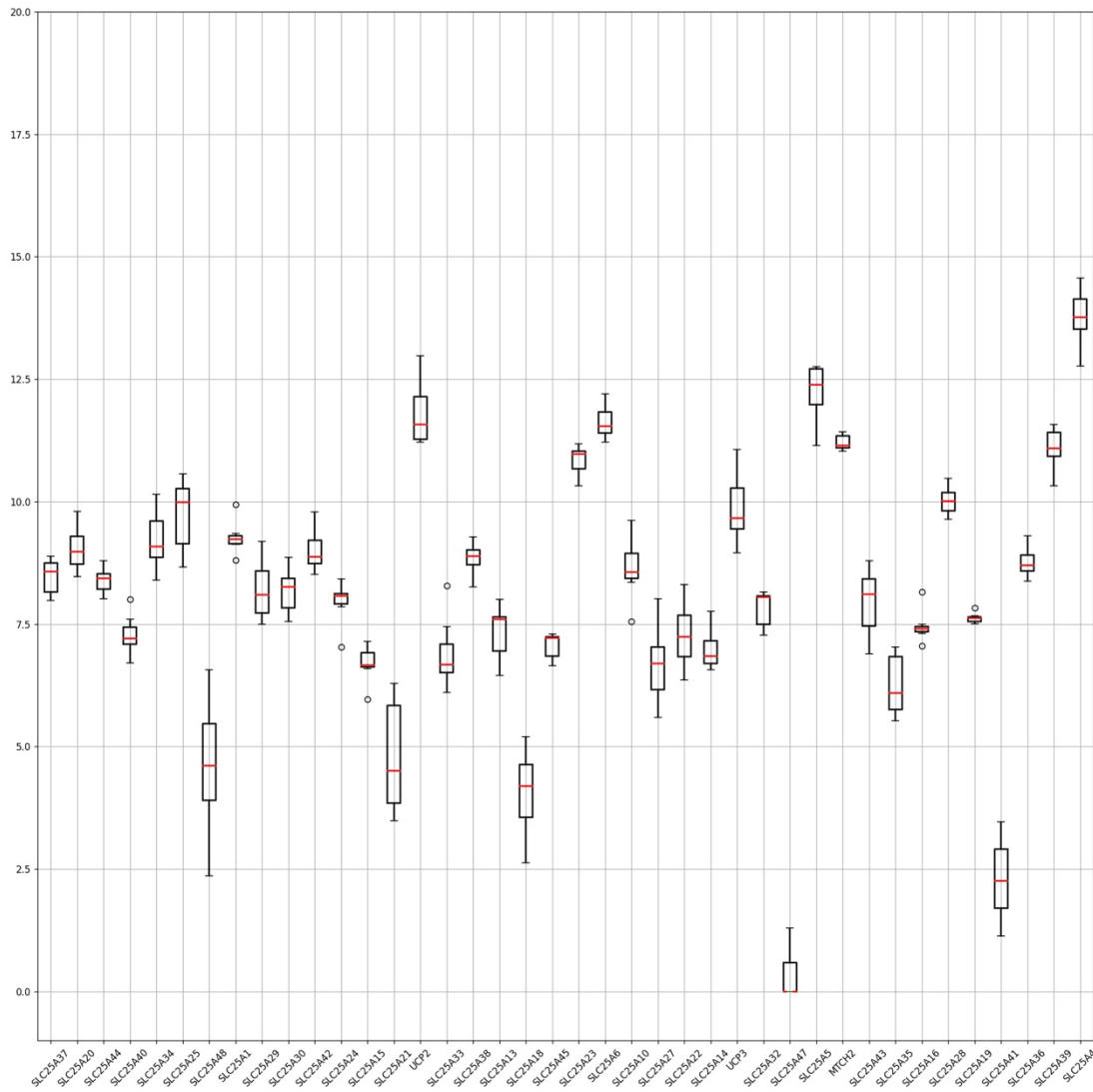


Figure S10P.

Boxplot of SLC25 transporter expression cluster 22 of GTEx normal tissues (log₂FPKM)

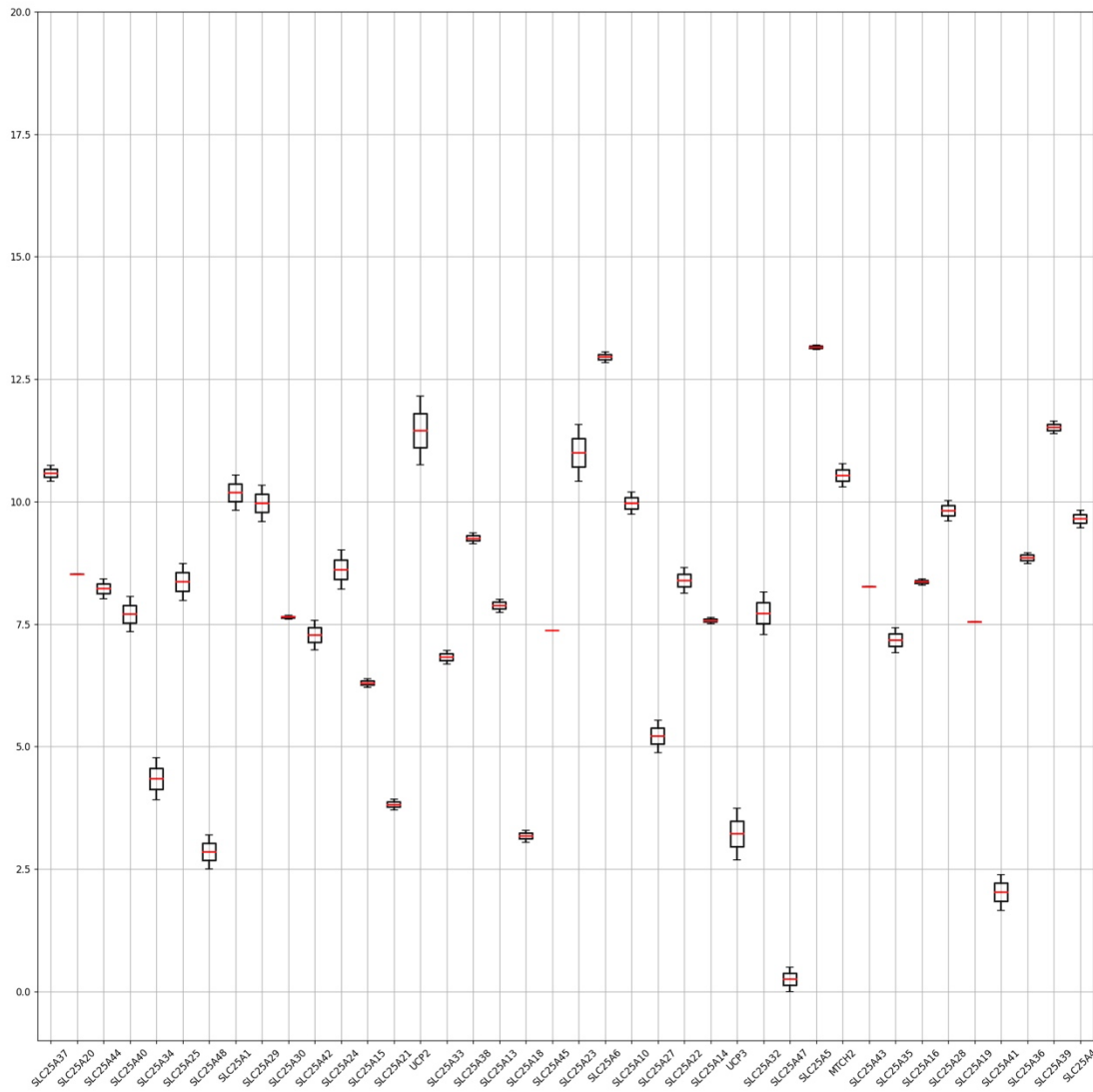


Figure S10Q.

Boxplot of SLC25 transporter expression cluster 23 of GTEx normal tissues (log₂FPKM)

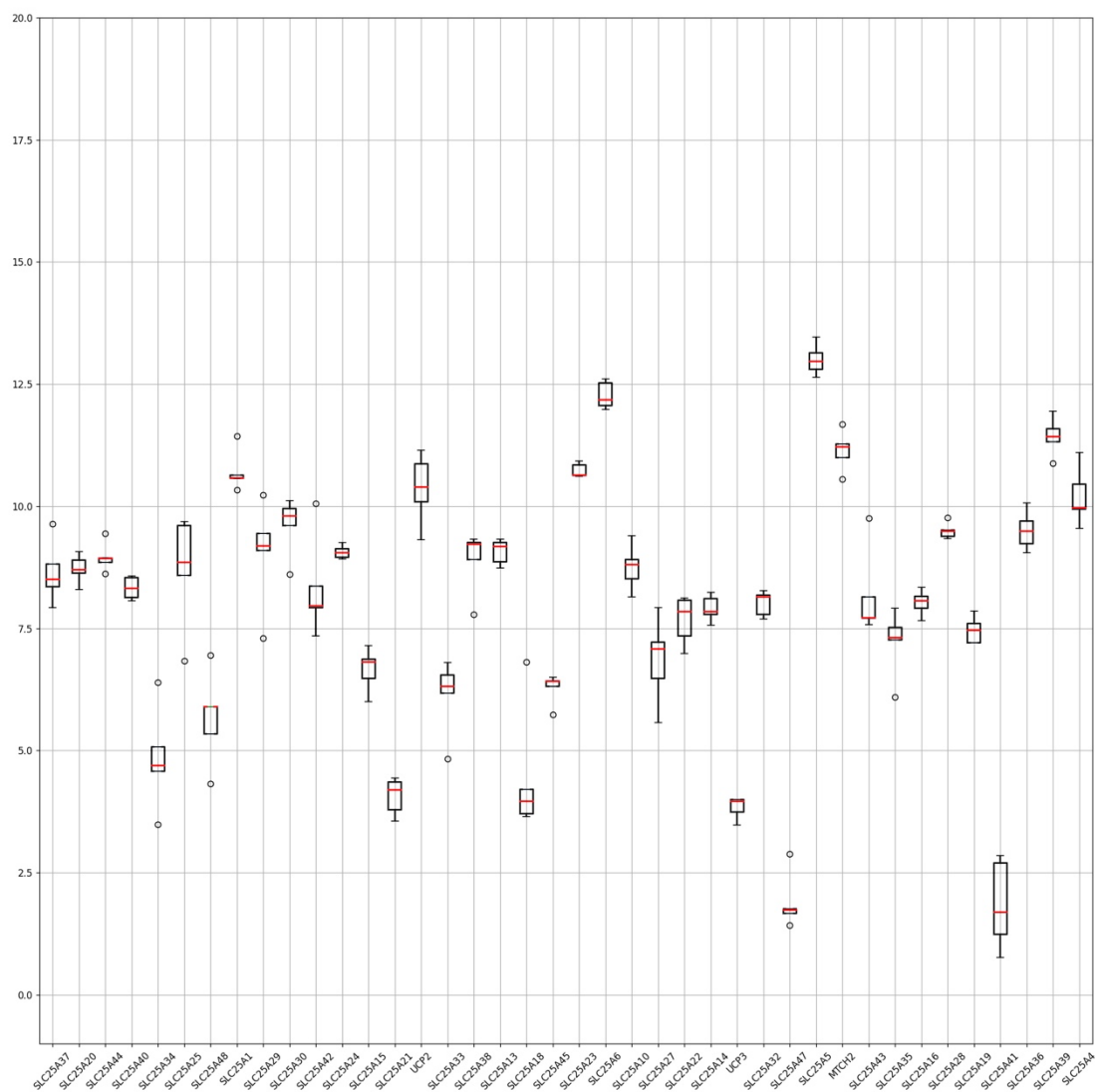


Figure S10R.

Boxplot of SLC25 transporter expression cluster 24 of GTEx normal tissues (log₂FPKM)

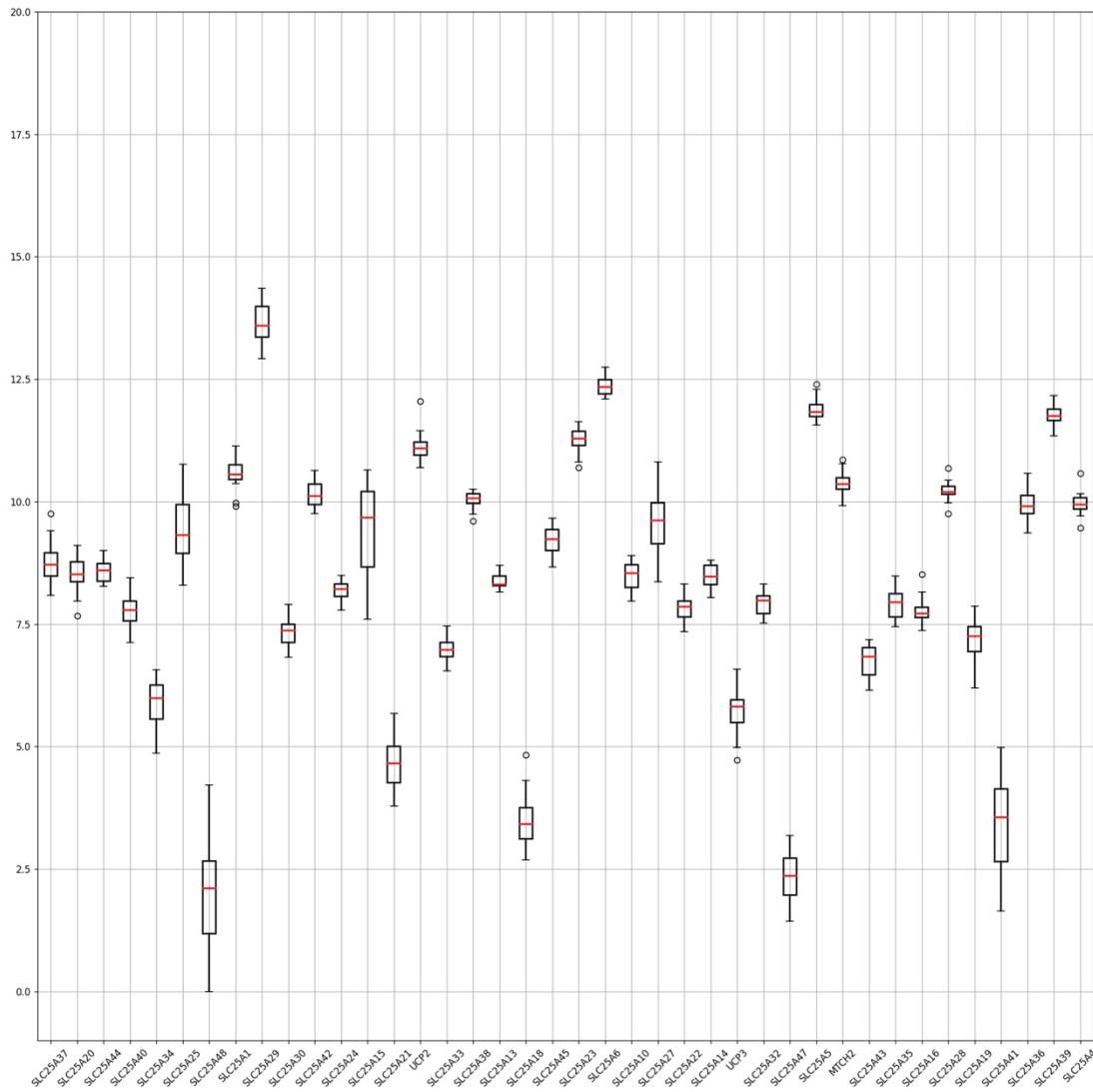


Figure S10S.

Boxplot of SLC25 transporter expression cluster 26 of GTEx normal tissues (log₂FPKM)

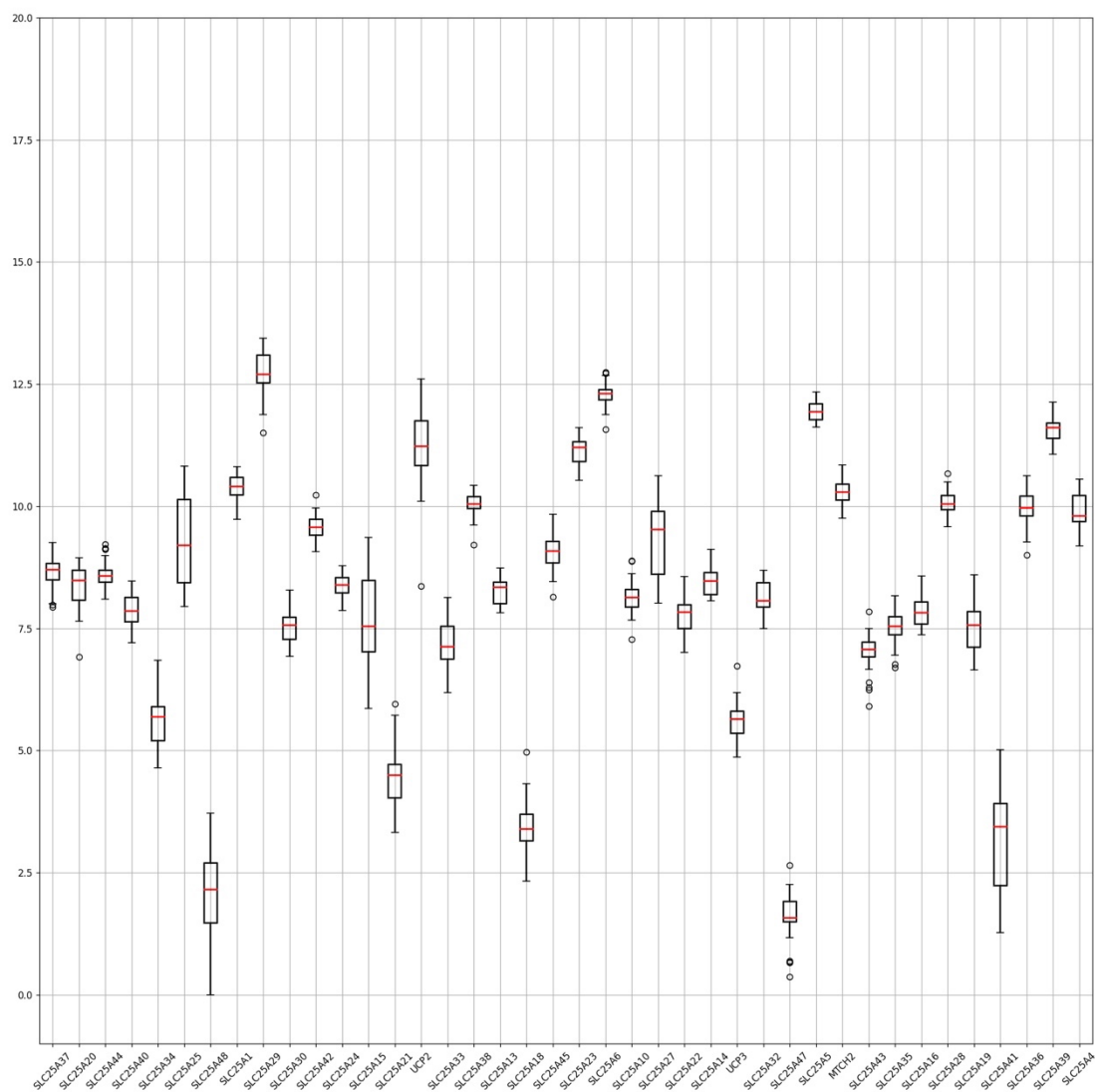


Figure S10T.

Boxplot of SLC25 transporter expression cluster 27 of GTEx normal tissues (log₂FPKM)

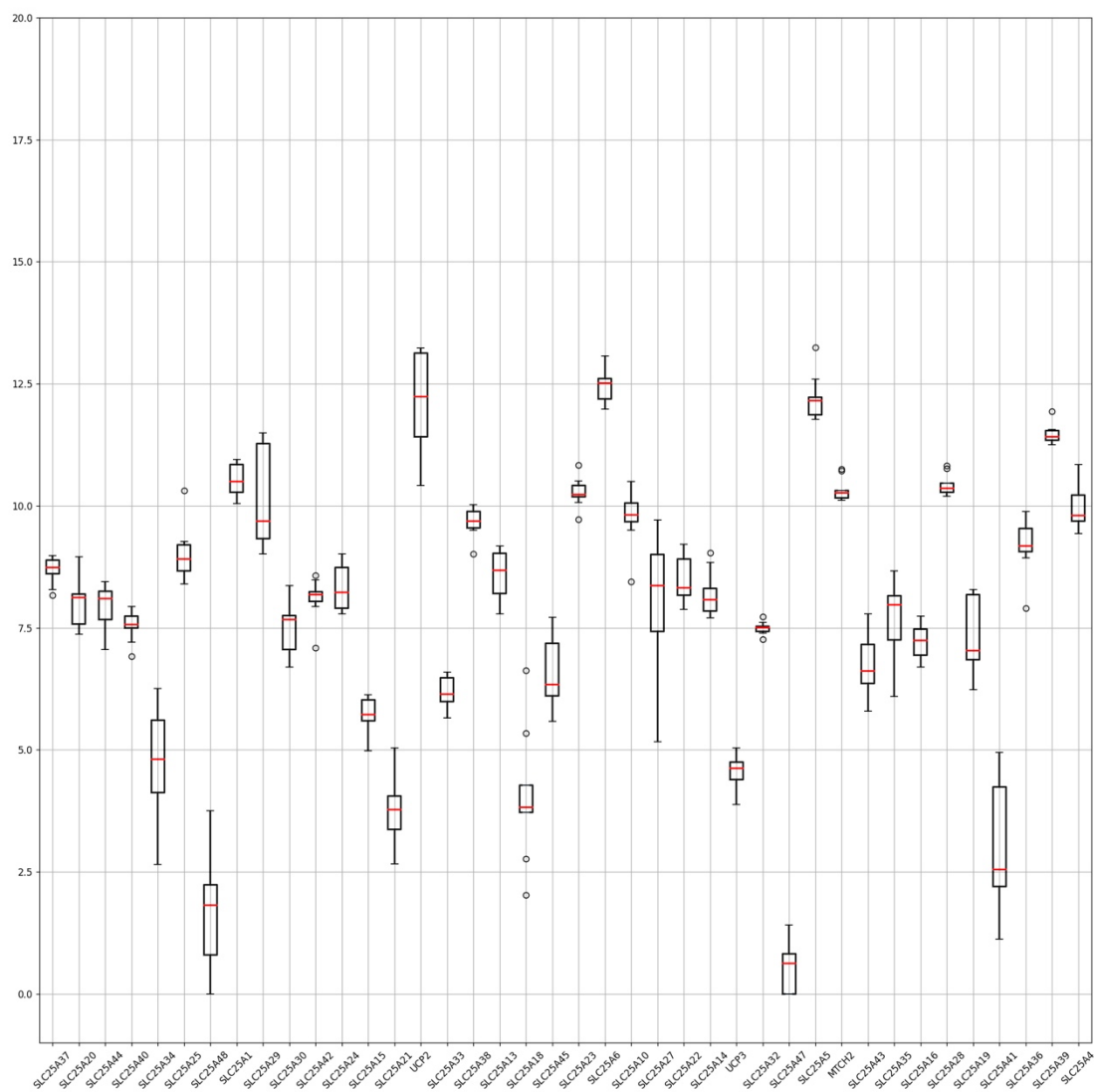


Figure S10U.

Boxplot of SLC25 transporter expression cluster 33 of GTEx normal tissues (log₂FPKM)

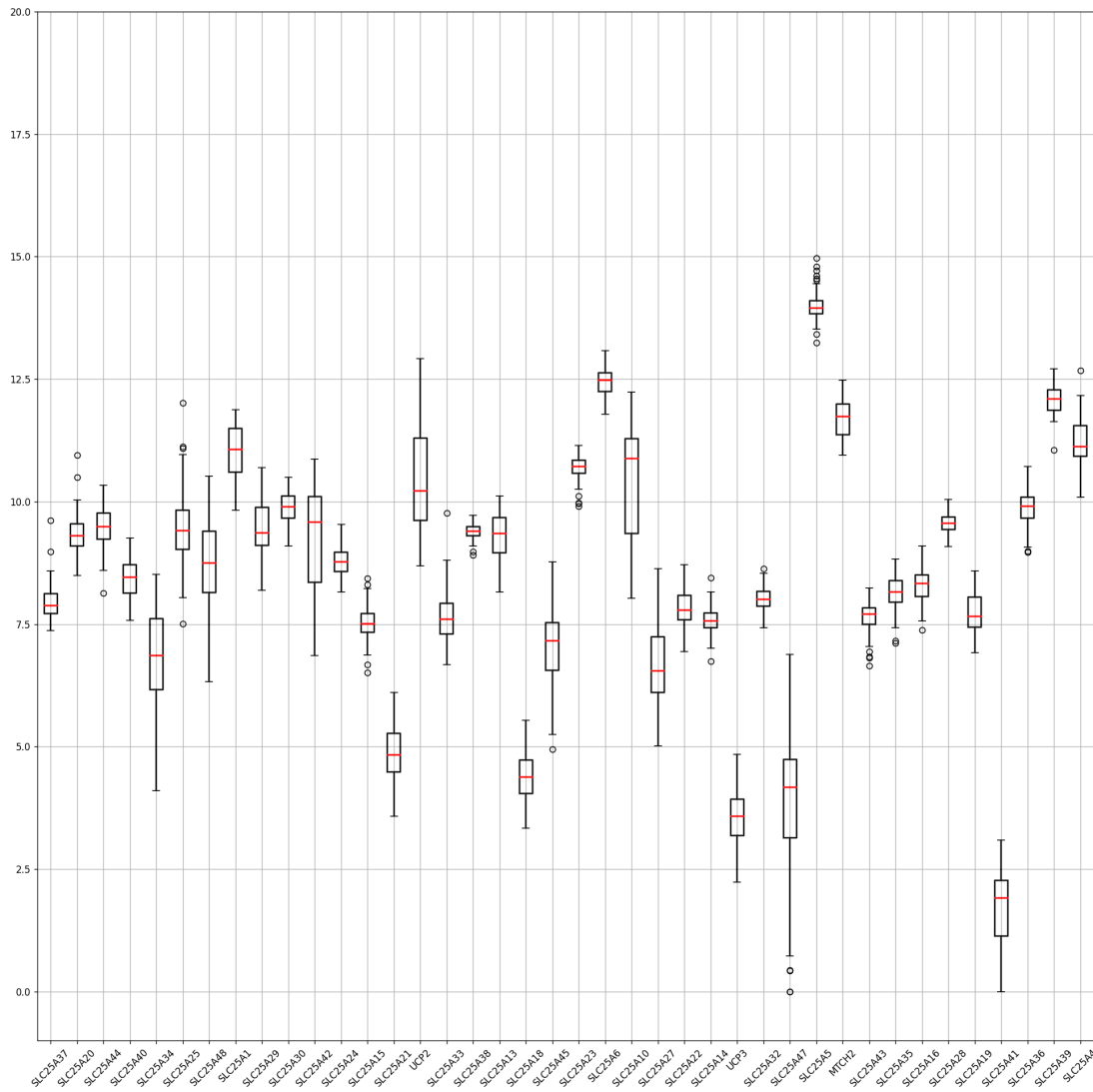


Figure S10V.

Boxplot of SLC25 transporter expression cluster 34 of GTEx normal tissues (log₂FPKM)

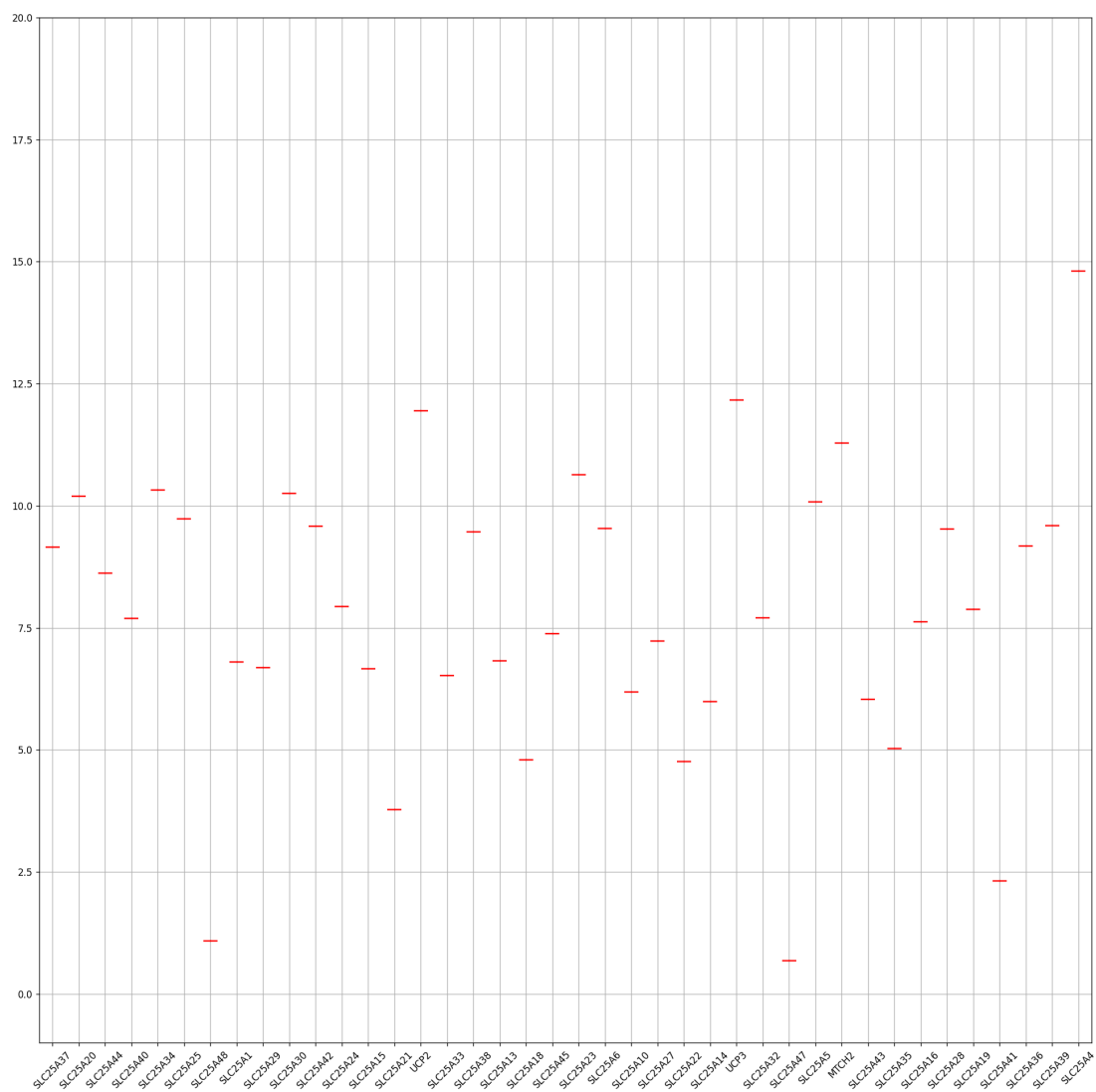


Figure S10W.

Boxplot of SLC25 transporter expression cluster 35 of GTEx normal tissues (log₂FPKM)

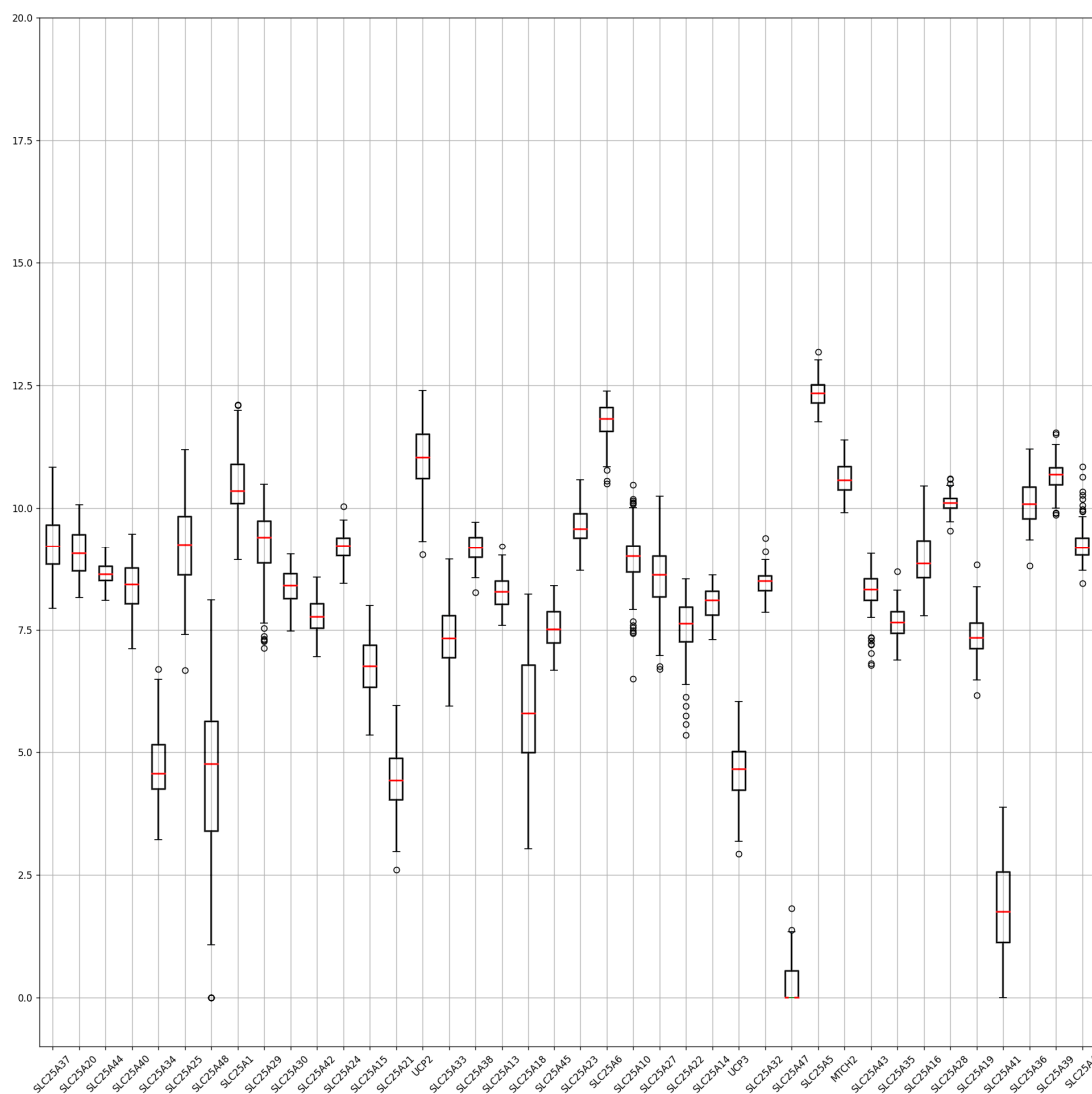


Figure S10X.

Boxplot of SLC25 transporter expression cluster 36 of GTEx normal tissues (log₂FPKM)

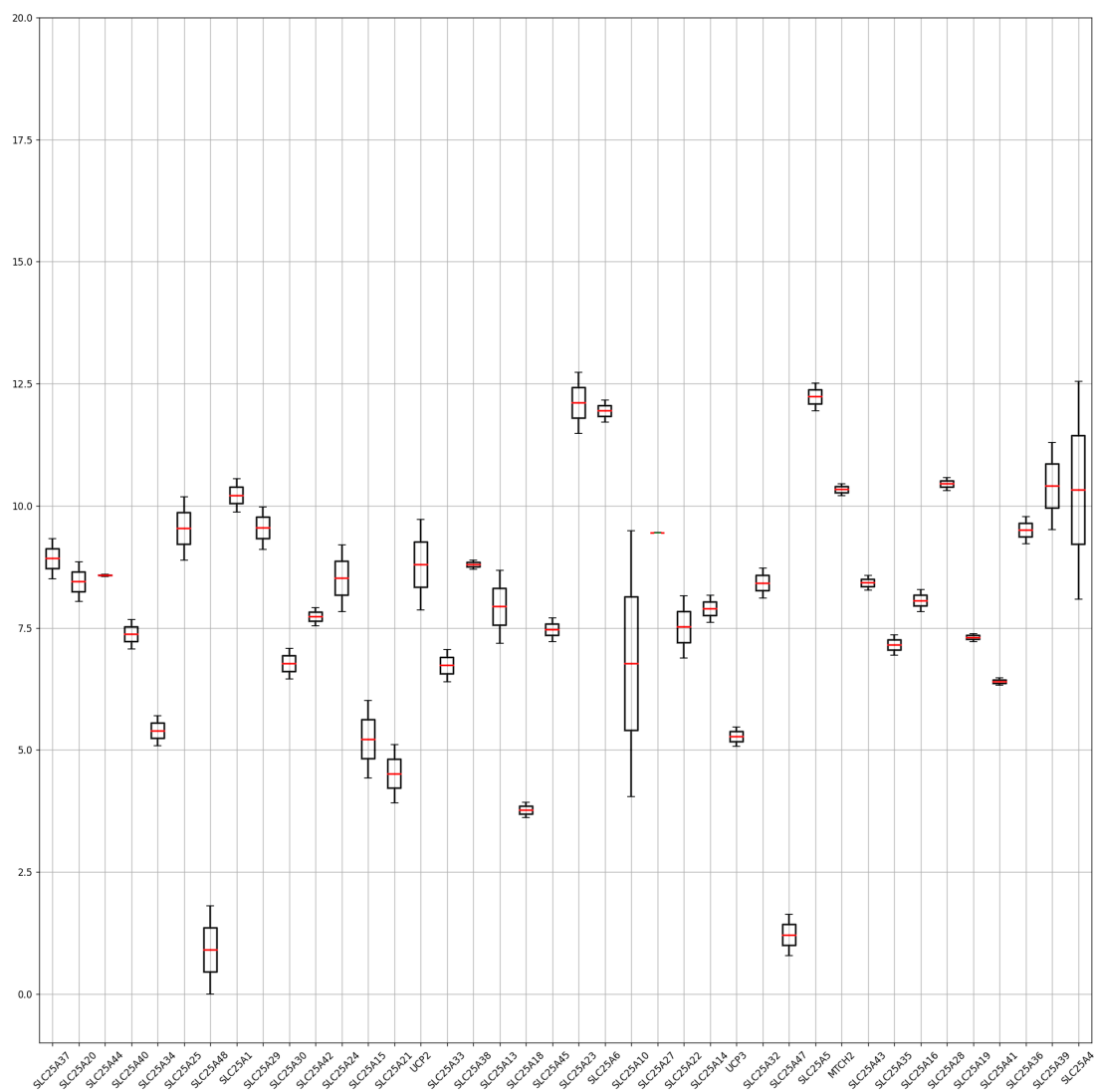


Figure S10Y.

Boxplot of SLC25 transporter expression cluster 40 of GTEx normal tissues (log₂FPKM)

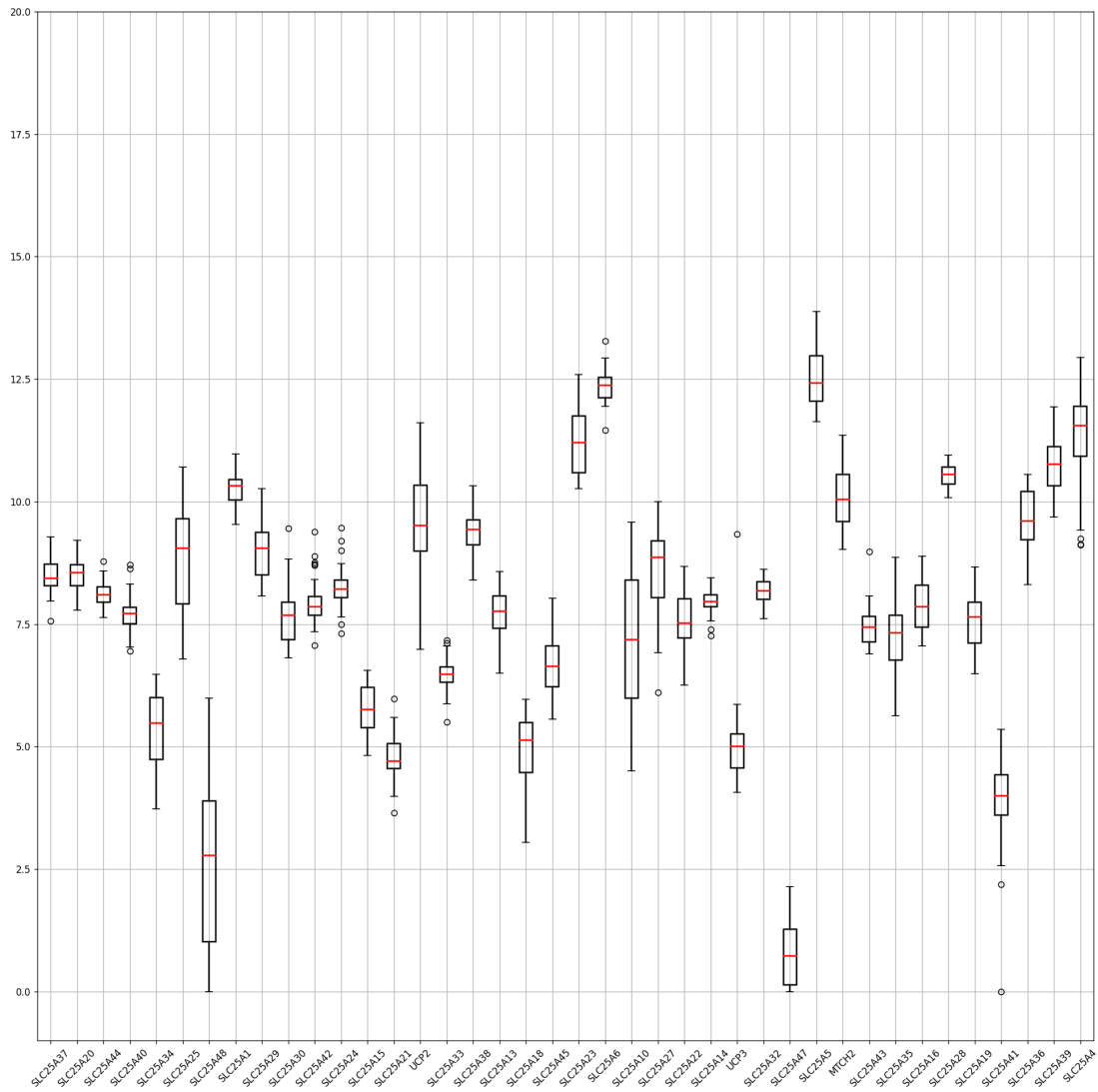


Figure S10Z.

Boxplot of SLC25 transporter expression cluster 41 of GTEx normal tissues (log₂FPKM)

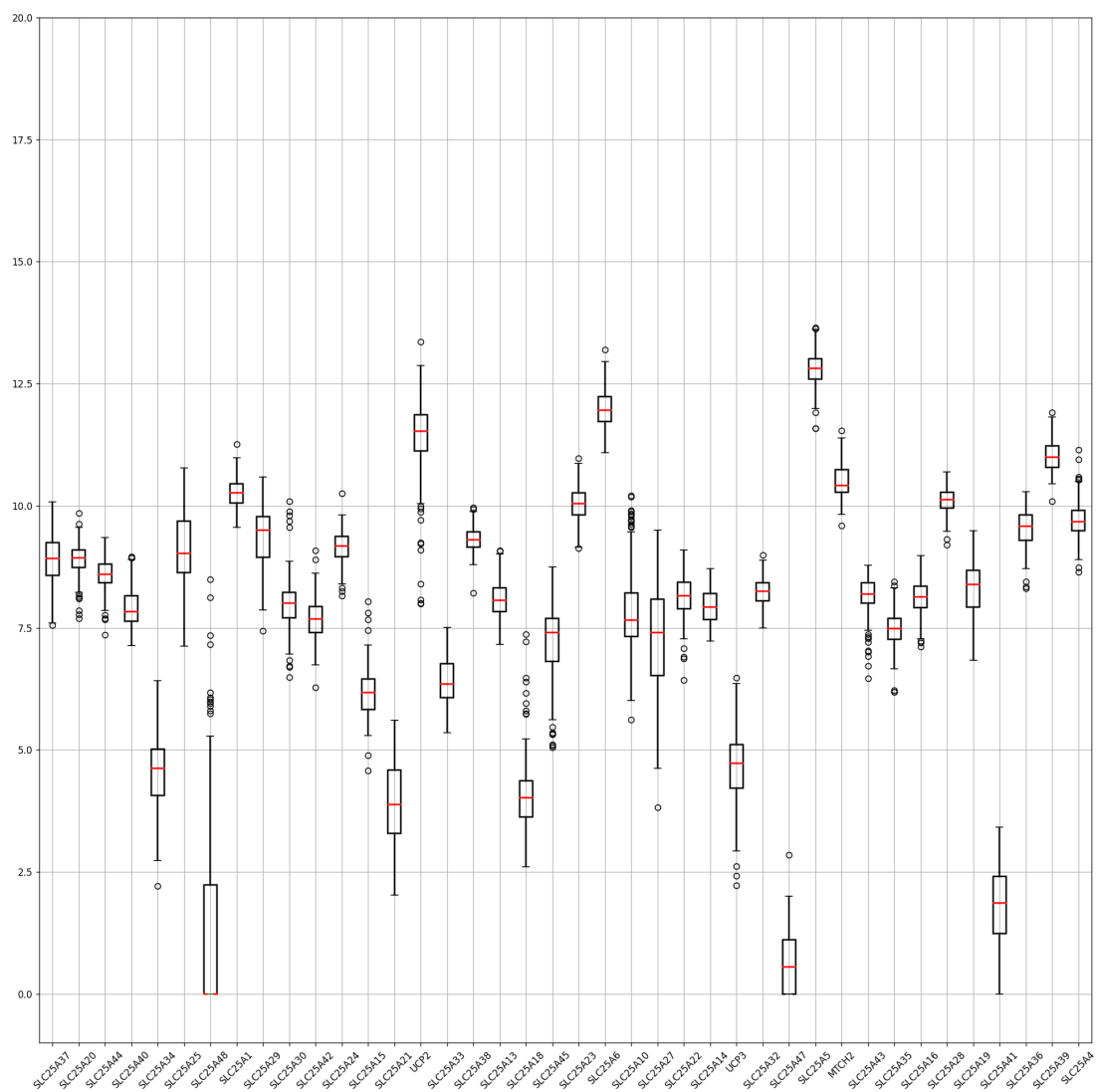


Figure S10AA.

Boxplot of SLC25 transporter expression cluster 42 of GTEx normal tissues (log₂FPKM)



Figure S10AB.

Boxplot of SLC25 transporter expression cluster 43 of GTEx normal tissues (log₂FPKM)

Table S1. Primers for qRT-PCR of enzyme and SLC25 transporter genes

REAGENTS	SOURCE	IDENTIFIER
ALDOA (cytosolic aldolase A) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.56a.39231 720.g standard desalting
GAC,KGA (mitochondrial and cytosolic variants of GLS1, glutaminase 1) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.328945 2 standard desalting
GCLC (cytosolic glutamate-cysteine ligase catalytic subunit) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.246294 standard desalting
GLDC [mitochondrial P-protein (pyridoxal phosphate-dependent glycine decarboxylase) of the GLDC (glycine decarboxylase complex or glycine cleavage system)] Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.199398 16 standard desalting
GLUD1 (mitochondrial glutamate dehydrogenase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.402150 18 standard desalting
GLUL (mitochondrial glutamine synthetase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.393722 30 standard desalting
IDH1 (cytosolic isocitrate dehydrogenase 1) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.256157 0 standard desalting
KGA (cytosolic variant of GLS1, glutaminase 1) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.364638 1 standard desalting
LDHA (cytosolic lactate dehydrogenase A) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.386900 93 standard desalting
MPC1 (mitochondrial pyruvate transporter) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.464556 99 standard desalting
MTFMT (mitochondrial methionyl-tRNA formyl transferase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.278674 96 standard desalting
MTHFD1 (cytosolic trifunctional c-1-tetrahydrofolate synthase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.229843 73 standard desalting
MTHFD2 (mitochondrial bifunctional methylenetetrahydrofolate dehydrogenase / cyclohydrolase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.274547 37 standard desalting
MTHFD2L (location and the catalytic properties of human MTHFD2 but expressed more ubiquitously) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.383980 95 standard desalting
PC (mitochondrial pyruvate carboxylase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.329652 9 standard desalting
PKM1, PKM2 (splice variants of human cytosolic pyruvate kinase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.147982 18 standard desalting
PKM1 (splice variants of human cytosolic pyruvate kinase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.561234 standard desalting
PPIA (peptidyl-prolyl cis-trans isomerase A) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.59a.22214 851 standard desalting

SHMT1 (cytosolic serine hydroxymethyltransferase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.249847 05 standard desalting
SHMT2 (mitochondrial serine hydroxymethyltransferase) Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.409116 90 standard desalting
SLC25A1 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.453156 71 standard desalting
SLC25A15 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00062867
SLC25A2 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00203931
SLC25A3 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00036043
SLC25A4 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00048279
SLC25A5 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00084189
SLC25A6 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00037191
SLC25A31 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.384246 72 standard desalting
SLC25A7 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.391570 06 standard desalting
SLC25A8 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.152949 23 standard desalting
SLC25A9 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.230898 93 standard desalting
SLC25A10 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00073724
SLC25A11 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.398077 18 standard desalting
SLC25A12 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00073010
SLC25A13 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00087906
SLC25A14 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00040544
SLC25A30 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00080941
SLC25A16 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00037849
SLC25A43 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.396340 62 standard desalting
SLC25A17 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00075502
SLC25A22 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.144191 78 standard desalting

SLC25A18 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.142616 0 standard desalting
SLC25A19 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00077490
SLC25A20 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.56a.21374 355 standard desalting
SLC25A21 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.282586 55 standard desalting
SLC25A23 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00044107
SLC25A24a QuantiTect Primer Assays	Qiagen	Cat# 249900 QT01019606
SLC25A24b QuantiTect Primer Assays	Qiagen	Cat# 249900 QT01019613
SLC25A25 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00002422
SLC25A41 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00052577
SLC25A26 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT01029497
SLC25A27 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00009100
SLC25A28 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00052801
SLC25A37 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00020559
SLC25A29 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00231623
SLC25A32 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.267262 72 standard desalting
SLC25A33 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.206021 54 standard desalting
SLC25A36 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00026208
SLC25A34 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT01033942
SLC25A35 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.231653 18 standard desalting
SLC25A38 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.106154 4 standard desalting
SLC25A39 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00083839
SLC25A40 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00040698
SLC25A42 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00041412
SLC25A44 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00093065
SLC25A45 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00060473

SLC25A46 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00013041
SLC25A47 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.250385 99.g standard desalting
SLC25A48 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.392816 77 standard desalting
SLC25A49 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.453755 49.g standard desalting
SLC25A50 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.151048 70 standard desalting
SLC25A51 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00202328
SLC25A52 QuantiTect Primer Assays	Qiagen	Cat# 249900 QT00271565
SLC25A53 Prime Time qPCR Primers	Integrated DNA Technologies	Hs.PT.58.427563 7 standard desalting

Table S2. Oligonucleotides and Recombinant DNA

Reagent	Source	Identifier
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A22 TGCTGTTGACAGTGAGCGACATGTCCGACTGCCTC ATCAATAGTGAAGCCACAGATGTATTGATGAGGCAG TCGGACATGCTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3395753
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A22 TGCTGTTGACAGTGAGCGCCCCCTTCTCTGTGGTGT ACTTTAGTGAAGCCACAGATGTAAAGTACACCACAG AGAAGGGGATGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3395755
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A22 TGCTGTTGACAGTGAGCGAAGAAGTCGCCTTTCTAC GTGATAGTGAAGCCACAGATGTATCACGTAGAAAG GCGACTTCTCTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3395752
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A32 TGCTGTTGACAGTGAGCGCCCGAAATATAATGGAAT TTTATAGTGAAGCCACAGATGTATAAAATTCCATTAT ATTTCGGTTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3398782
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A32 TGCTGTTGACAGTGAGCGCACAGTATGATGCTGTTG TTAATAGTGAAGCCACAGATGTATTAACAACAGCAT CATACTGTATGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3398780
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A32 TGCTGTTGACAGTGAGCGCGTTGAGCACAGTAGAA TATAATAGTGAAGCCACAGATGTATTATATTCTACTG TGCTCAACTTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3398783
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A43 TGCTGTTGACAGTGAGCGCTAGCACCTTTGAGTTCT GCAATAGTGAAGCCACAGATGTATTGCAGAACTCAA AGGTGCTAATGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3236863
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A43 TGCTGTTGACAGTGAGCGACCAGGAATTACGAGAA TTAAATAGTGAAGCCACAGATGTATTTAATTCTCGTA ATTCCTGGGTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3236859
Lentiviral pZIP-TRE3G - V125 vector encoding tetracycline inducible shRNA targeting human SLC25A43 TGCTGTTGACAGTGAGCGCTGGTTACATTCTGTCTC CACATAGTGAAGCCACAGATGTATGTGGAGACAGA ATGTAACCATTGCCTACTGCCTCGGA	transOMIC technologies	ULTRA-3236864
Lentiviral pZIP-TRE3G - V125	transOMIC technologies	N/A

psPAX2	Addgene	Plasmid #12260
pCMV-VSV-G	Addgene	Plasmid #8485

Table S3. Results of the F1 scores for SVM, KNN, RF, GBT and GNB tests

Classification model	Run 1	Run 2	Run 3	Run 4	Run 5
SVM	0.86413245	0.80966841	0.85548812	0.85793773	0.85617276
KNN	0.74035855	0.71975537	0.74828806	0.75209747	0.75324551
RF	0.68800053	0.6846961	0.69532281	0.71585688	0.70805913
GBT	0.732525	0.75331907	0.74607151	0.75168713	0.75039186
GNB	0.64639778	0.61877729	0.63198712	0.66647984	0.64625803

Table S4. The results of the test against the reserved test data set. Precision: $TP / (TP + FP)$; Recall: $TP / (TP + FN)$; F1-score: $TP / (TP + 1/2 * (FP + FN))$; Support: number of samples. The macro avg is the mean of all the scores, while the weighted avg is the mean score adjusted by the support.

cluster	precision	recall	f1-score	support	cluster	precision	recall	f1-score	support
0	0.96	0.99	0.97	87	19	1.00	0.33	0.50	3
1	0.91	0.95	0.93	99	20	0.92	0.90	0.91	116
2	1.00	0.73	0.84	22	21	0.84	0.86	0.85	174
3	0.86	0.86	0.86	172	22	0.75	0.75	0.75	4
4	0.83	1.00	0.91	5	23	0.88	0.78	0.83	58
5	0.81	0.76	0.79	34	24	0.88	0.99	0.93	141
6	0.94	0.93	0.93	68	26	0.96	1.00	0.98	26
7	0.84	0.89	0.86	149	27	0.97	0.90	0.93	62
8	0.90	0.80	0.85	66	31	0.88	0.93	0.91	162
9	0.90	0.76	0.83	34	32	0.87	0.91	0.89	141
10	1.00	1.00	1.00	4	33	0.96	0.95	0.96	124
11	0.87	0.91	0.89	53	34	0.95	0.93	0.94	56
12	0.83	0.87	0.85	52	36	0.92	0.80	0.86	60
13	1.00	0.97	0.98	29	38	0.86	0.83	0.84	246
14	0.88	0.91	0.89	172	39	1.00	0.80	0.89	5
15	1.00	0.83	0.91	6	40	0.75	1.00	0.86	6
16	0.86	0.93	0.89	99	41	1.00	0.77	0.87	22
17	0.87	0.87	0.87	15	42	0.88	0.83	0.85	140
					43	0.93	0.76	0.84	17
					accuracy			0.89	2729
					macro avg	0.90	0.86	0.88	2729
					weighted avg	0.89	0.89	0.89	2729

Table S5. Results tested against the GTEx data set that was filtered from use in the training data

cluster	precision	recall	f1-score	support	cluster	precision	recall	f1-score	support
0	0.67	1.00	0.80	4	20	0.96	0.90	0.93	162
1	0.89	0.89	0.89	65	21	0.84	0.81	0.83	194
2	0.67	0.87	0.75	53	22	0.75	1.00	0.86	3
3	0.92	0.85	0.88	40	23	0.84	0.82	0.83	39
4	1.00	0.85	0.92	100	24	0.25	0.40	0.31	5
5	0.78	0.81	0.80	239	26	0.97	0.96	0.97	141
6	1.00	0.75	0.86	4	27	0.91	0.93	0.92	168
7	0.76	0.73	0.75	26	28	0.00	0.00	0.00	1
8	0.40	0.50	0.44	4	29	0.00	0.00	0.00	12
9	0.00	0.00	0.00	0	30	0.00	0.00	0.00	8
10	0.86	0.80	0.83	15	31	0.33	0.33	0.33	3
11	1.00	1.00	1.00	1	32	0.00	0.00	0.00	0
12	0.71	0.95	0.82	21	33	0.44	0.78	0.56	9
13	0.00	0.00	0.00	0	34	0.86	1.00	0.92	18
14	0.57	0.78	0.66	36	36	0.71	0.88	0.78	90
15	1.00	1.00	1.00	3	38	0.53	0.56	0.55	16
16	0.85	0.85	0.85	27	39	1.00	0.40	0.57	5
17	0.88	1.00	0.93	7	40	0.74	0.29	0.41	80
18	0.00	0.00	0.00	1	41	0.89	0.78	0.83	387
19	0.49	0.79	0.60	107	42	0.67	0.80	0.73	142
					43	0.86	0.66	0.75	86
					accuracy			0.80	2322
					macro avg	0.63	0.65	0.63	2322
					weighted avg	0.82	0.80	0.80	2322

Table S6. Human mitochondrial SLC25 transporter family

SLC25	Name / Substrate	SLC25	Name / Substrate	SLC25	Name / Substrate
A1 ^{1,2}	citrate, CTP	A43 ³	?	A33 ⁴	PNC1
A15 ⁵	ornithine, ORNT1	A17 ^{*6}	CoA, FAD, NAD ⁺	A36 ⁷	PNC2
A2 ⁸	ornithine, ORNT2	A22 ⁹	glutamate 1	A34 ¹⁰	?
A3 ^{11,12}	phosphate, Cu, PTP	A18 ¹³	glutamate 2	A35 ¹⁴	?
A4 ¹⁵⁻¹⁷	ADP/ATP, T1	A19 ¹⁸	thiamine PP	A38 ¹⁹	glycine
A5 ²⁰	ADP/ATP, T2	A20 ²¹	acylcarnitine	A39 ²²	glutathione, heme
A6 ²³	ADP/ATP, T3	A21 ^{24,25}	2-oxodicarboxylate	A40 ²⁶	MCFP
A31 ²⁷	ADP/ATP, T4	A23 ²⁸	APC2	A42 ^{29,30}	CoA, ADP
A7 ³¹	UCP1	A24b ³²	APC1iso2	A44 ³³	BCAA
A8 ³⁴	UCP2, C4 metabolites	A24a ³²	APC1iso1	A45 ³⁵	?
A9 ³⁶	UCP3	A25 ³⁷	APC3	A46 ³⁸	mito fission
A10 ³⁹	dicarboxylate	A41 ⁴⁰	APC4	A47 ⁴¹	HDMCP, UCP?
A11 ⁴²	oxoglutarate-malate	A26 ^{43,44}	SAM	A48 ⁴⁵	?
A12 ⁴⁶	asp-glu, aralar 1	A27 ⁴⁷	UCP4	A49 ⁴⁸	MTCH1apo
A13 ⁴⁹	asp-glu, aralar 2	A28 ⁵⁰	mitoferrin2	A50 ⁵¹	MTCH2adi
A14 ⁵²	UCP5, BMCP1	A37 ⁵³	mitoferrin1	A51 ⁵⁴	NAD ⁺ ,MCART1
A30 ⁵⁵	KMPC1	A29 ^{56,57}	BAA	A52 ¹⁴	MCART2
A16 ⁵⁸	CoA, Grave's disease	A32 ⁵⁹	THF	A53 ⁶⁰	MCART6

Note: transporters grouped between red lines have high sequence similarity, i.e. they have at least one transmembrane helix with similarity E-value of less than 1e-04. Name/Substrate (transporter name or transported substrate). BMCP1 (brain mitochondrial carrier protein 1), KMCP1 (kidney mitochondrial carrier protein 1), A17* (peroxisomal membrane protein 34, the only known SLC25 transporter expressed in peroxisomes and not in mitochondria), A24a and b isoforms differ in their N-terminal sequences (about 50 residues) and are shown in most data as only A24, BAA (basic amino acids), THF (tetrahydrofolate), MCFP (mitochondrial carrier family protein), BCAA (branched-chain amino acids), HDMCP (hepatocellular carcinoma-down regulated mitochondrial carrier protein), MTCH1apo (apoptosis-related), MTCH2adi (adipocyte-related). The SLC25 transporters are referred to in the text without the SLC25.

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Table S7. L10 and S10 SLC25 transporters for kidney and colon cell lines

L10						S10					
Kidney				Colon		Kidney				Colon	
RXF-393	CAKI-1	786-O	A498	HCT-116	HT-29	RXF-393	CAKI-1	786-O	A498	HCT-116	HT-29
A32	A32	A24	A43	A21	A22	A47	A48	A33	A48	A18	A21
A43	A22	A32	A22	A22	A8	A35	A42	A48	A25	A34	A34
A24	A14	A43	A32	A30	A32	A27	A29	A18	A4	A25	A48
A14	A19	A22	A23	A32	A28	A48	A27	A27	A34	A24	A20
A23	A43	A40	A14	A19	A40	A25	A34	A25	A29	A45	A4
A37	A24	A3	A39	A39	A19	A34	A18	A34	A33	A20	A9
A40	A39	A14	A46	A36	A15	A20	A47	A4	A42	A8	A24
A22	A36	A1	A24	A17	A17	A4	A25	A45	A27	A13	A45
A36	A15	A17	A41	A33	A39	A8	A20	A30	A20	A44	A41
A1	A26	A19	A10	A26	A30	A45	A21	A20	A5	A16	A16

Note: transcript ratios were calculated by dividing the average of n=2 qRT-PCR values from the CCLs by the average qRT-PCR values from the seven uninvolved ccRcc tissues or the six (no matched uninvolved tissue for 3463-3T) uninvolved CRC tissues.