Supplementary Information

Amino acid composition analysis of human secondary transport proteins and implications for reliable membrane topology prediction

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Supplementary Tables S1-S4

Supplementary Table S1. List and details of human secondary transport proteins (1-50).

	Protein	UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
1	NP_006832(SLC38A3)	Q99624	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	504	55,773	11
2	NP_060701(SLC38A7)	Q9NVC3	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	462	49,966	11
3	NP_277053(SLC38A5)	Q8WUX1	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	472	51,487	10
4	NP_510968(SLC36A1)	Q7ZZH8	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	476	53,076	10
5	NP_542119(SLC32A1)	Q9H598	TD/UP	Amino Acid/Auxin Permease (AAP)	vesicular inhibitory amino acid (GABA/glycine)	525	57,415	11
6	NP_060488(SLC38A4)	Q96916	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	547	60,764	8
7	NP_612637(MGC15523)	Q9HBR0-2	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	780	83,324	11
8	NP_061849(SLC38A2)	Q96QD8	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	506	56,026	10
9	NP_109599(SLC38A1)	Q9H2H9*	TD	Amino Acid/Auxin Permease (AAP)	amino acid	527	58,915	10
10	NP_689526(SLC36A4)	Q6YBV0	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	504	56,157	10
11	NP_722518(SLC38A6)	Q8IZM9	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	456	50,947	11
12	NP_775783(FIJ39822)	Q08A16-2	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	384	42,448	10
13	NP_775785(SLC38A9)	B3KVK8	TD/UP	Amino Acid/Auxin Permease (AAP)	amino acid	561	63,790	11
14	NP_000333(SLC4A1)	P02730	TD/UP	Anion Exchanger (AE)	anion exchange	911	101,792	11
15	NP_003750(SLC4A4)	Q9Y6R1*	TD	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1,035	116,040	11
16	NP_071341(SLC4A10)	Q6U841	TD/UP	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1,088	122,685	11
17	NP_114423(SLC4A11)	Q8NBS3	TD/UP	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	891	99,581	13
18	NP_597812(SLC4A5)	Q9BY07-3	TD/UP	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1121	124,551	11
19	NP_067019(SLC4A5)	Q9BY07-1	TD/UP	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1137	126,255	11
20	NP_003606(SLC4A7)	Q9Y6M7	TD/UP	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1214	136,044	11
21	NP_003031(SLC4A2)	P04920	TD/UP	Anion Exchanger (AE)	anion exchange	1241	137,009	11
22	NP_113655(SLC4A9)	Q96Q91	TD/UP	Anion Exchanger (AE)	anion exchange	945	104,132	13
23	NP_004849(SLC4A8)	Q2Y0W8*	TD	Anion Exchanger (AE)	sodium ion/bicarbonate anion symporter	1044	117,442	11
24	NP_005061(SLC4A3)	P48751	TD/UP	Anion Exchanger (AE)	chloride/bicarbonate anion exchange	1232	135,791	13
25	NP_003036(SLC7A1)	P30825	TD/UP	Amino Acid-Polyamine-Organocation (APC)	cationic amino acid	629	67,638	14
26	NP_003037(SLC7A2)	P52569	TD/UP	Amino Acid-Polyamine-Organocation (APC)	cationic amino acid	657	71,741	14
27	NP_004164(SLC7A4)	O43246	TD/UP	Amino Acid-Polyamine-Organocation (APC)	cationic amino acid	636	68,355	13
28	NP_036376(SLC7A8)	Q9UHI5	TD/UP	Amino Acid-Polyamine-Organocation (APC)	large neutral amino acid	535	58,382	12
29	NP_055085(SLC7A9)	P82251	TD/UP	Amino Acid-Polyamine-Organocation (APC)	amino acid	487	53,481	12
30	NP_055146(SLC7A11)	Q9UPY5	TD/UP	Amino Acid-Polyamine-Organocation (APC)	cysteine/glutamate	501	55,423	12
31	NP_062823(SLC7A10)	Q9NS82	TD/UP	Amino Acid-Polyamine-Organocation (APC)	amino acid	523	56,798	12
32	NP_003477(SLC7A5)	Q01650	TD/UP	Amino Acid-Polyamine-Organocation (APC)	large neutral amino acid	507	55,010	12
33	NP_620172(SLC7A13)	Q8TCU3	TD/UP	Amino Acid-Polyamine-Organocation (APC)	amino acid	470	52,114	12
34	NP_003973(SLC7A7)	Q9UM01	TD/UP	Amino Acid-Polyamine-Organocation (APC)	amino acid	511	56,019	12
35	NP_116192(SLC7A3)	Q8WY07	TD/UP	Amino Acid-Polyamine-Organocation (APC)	cationic amino acid transporter 3 (CAT-3)	619	67,169	14
36	NP_000266(OCA2)	Q04671	TD/UP	Arsenite-Antimonite (ArsB) Efflux	P-protein homolog (tyrosine transporter)	838	92,850	12
37	NP_003040(SLC10A1)	Q14973	TD/UP	Bile Acid:Na ⁺ Symporter (BASS)	sodium ion:bile acid symporter	349	38,119	9
38	NP_000443(SLC10A2)	Q12908	TD/UP	Bile Acid:Na ⁺ Symporter (BASS)	sodium ion:bile acid symporter	348	37,714	9
39	NP_062822(SLC10A3)	P09131	TD/UP	Bile Acid:Na ⁺ Symporter (BASS)	sodium ion:bile acid symporter	477	50,333	8
40	NP_689892(SLC10A4)	Q96EP9	TD/UP	Bile Acid:Na ⁺ Symporter (BASS)	sodium ion:bile acid symporter	437	46,504	9
41	NP_115504(DKFZP566M114)	Q0GE19-5	TD/UP	Bile Acid:Na ⁺ Symporter (BASS)	sodium ion:bile acid symporter 7	159	17,283	5
42	NP_004718(SLC24A1)	O60721	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion+potassium ion antiporter 1	1099	121,374	11
43	NP_065077(SLC24A2)	Q9UI40	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion+potassium ion antiporter 1	661	73,664	9
44	NP_066920(SLC8A1)	P32418	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium:calcium ion antiporter 1	973	104,689	10
45	NP_079235(SLC24A6)	Q6J4K2	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion+potassium ion antiporter 6	584	64,231	12
46	NP_705934(SLC24A4)	Q8NFF2-2	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion+potassium ion antiporter 4	558	61,938	10
47	NP_705932(SLC24A4)	Q8NFF2*	TD	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion+potassium ion antiporter 4	605	66,951	10
48	NP_150287(SLC8A3)	P57103*	TD	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion antiporter	925	102,804	10
49	NP_489479(SLC8A3)	P57103-6	TD/UP	Calcium-Cation Antiporter (CaCA)	sodium ion:calcium ion antiporter 3	924	102,694	10
50	NP_001037(SLC12A2)	P55011	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion+potassium ion:chloride ion symporter	1212	131,447	13

Supplementary Table S1 continued. List and details of human secondary transport proteins (51-100).

Protein		UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
51	NP_000330(SLC12A3)	P55017	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion:potassium ion:chloride ion symporter	1030	113,936	13
52	NP_000329(SLC12A1)	Q13621	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion:potassium ion:chloride ion symporter	1099	121,450	13
53	NP_005063(SLC12A4)	Q9UP95	TD/UP	Cation-Chloride Cotransporter (CCC)	potassium ion:chloride ion symporter	1085	120,650	12
54	NP_006589(SLC12A7)	Q9Y666	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion:potassium ion:chloride ion symporter	1083	119,106	12
55	NP_064631(SLC12A9)	Q9BXP2	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion:potassium ion:chloride ion symporter	914	96,110	13
56	NP_065759(SLC12A5)	Q9H2X9*	TD	Cation-Chloride Cotransporter (CCC)	potassium ion:chloride ion symporter	1116	123,511	12
57	NP_078904(SLC12A8)	A0AV02	TD/UP	Cation-Chloride Cotransporter (CCC)	sodium ion:potassium ion:chloride ion symporter	714	78,239	12
58	NP_005126(SLC12A6)	Q9UHW9*	TD	Cation-Chloride Cotransporter (CCC)	potassium ion:chloride ion symporter	1099	122,091	12
59	NP_006336(SLC30A9)	Q6PML9	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	568	63,515	5
60	NP_061183(SLC30A10)	Q6XR72	UP	Cation Diffusion Facilitator (CDF)	manganese	485	52,684	6
61	NP_067017(SLC30A1)	Q9Y6M5	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	507	55,300	6
62	NP_598003(SLC30A7)	Q8NEW0	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	376	41,626	6
63	NP_037441(SLC30A4)	Q14863	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	429	47,483	6
64	NP_003450(SLC30A3)	Q99726	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	388	41,945	6
65	NP_060434(SLC30A6)	Q6NXT4	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	461	51,116	6
66	NP_776250(SLC30A8)	Q8IWU4	TD/UP	Cation Diffusion Facilitator (CDF)	zinc ion	369	40,755	6
67	NP_115902(SLC30A2)	Q9BRI3	TD/UP	Cation Diffusion Facilitator (CDF)	vesicular zinc ion uptake	323	35,178	6
68	NP_075053(SLC30A5)	Q8TAD4	TD/UP	Cation Diffusion Facilitator (CDF)	granule zinc ion uptake	765	84,047	14
69	NP_000074(CLCN1)	P35523	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	988	108,626	11
70	NP_001821(CLCN4)	P51793	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	760	84,917	10
71	NP_000075(CLCN5)	P51795	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	746	83,147	10
72	NP_000076(CLCNKB)	P51801	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	687	75,446	11
73	NP_004357(CLCN2)	P51788	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	898	98,495	10
74	NP_068505(CLCN6)	P51797-4	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	308	34,443	3
75	NP_068504(CLCN6)	P51797-3	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	353	38,742	6
76	NP_068503(CLCN6)	P51797-2	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	320	35,934	3
77	NP_001277(CLCN6)	P51797-1	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	869	97,289	12
78	NP_001278(CLCN7)	P51798	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel	805	88,679	12
79	NP_004061(CLCNKA)	P51800	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel Ka	687	75,285	11
80	NP_001820(CLCN3)	P51790	TD/UP	Chloride Carrier/Channel (CIC)	chloride ion channel 3	820	91,243	10
81	NP_004203(SLC28A2)	Q43868	TD/UP	Concentrative Nucleoside Transporter (CNT)	sodium ion:nucleoside symporter 3	658	71,926	11
82	NP_071410(SLC28A3)	Q9HAS3	TD/UP	Concentrative Nucleoside Transporter (CNT)	sodium ion:nucleoside symporter 4	691	76,930	11
83	NP_004204(SLC28A1)	Q00337	TD/UP	Concentrative Nucleoside Transporter (CNT)	sodium ion:nucleoside symporter 2	649	71,584	11
84	NP_775924(SLC9A9)	Q8IVB4	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	645	72,565	8
85	NP_115980(SLC9A7)	Q96T83	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	725	80,131	9
86	NP_004165(SLC9A3)	P48764	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	834	92,855	13
87	NP_004585(SLC9A5)	Q14940	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	896	99,012	13
88	NP_003039(SLC9A2)	Q9UBY0	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	812	91,520	9
89	NP_003038(SLC9A1)	P19634	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	815	90,763	12
90	NP_006350(SLC9A6)	Q92581	TD/UP	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	669	74,162	13
91	NP_631912(LOC150159)	Q4ZJ4*	TD	Monovalent Cation:Proton Antiporter-1 (CPA1)	sodium ion:proton antiporter	220	24,471	5
92	NP_060375(TMC03)	Q6UWJ1	TD/UP	Monovalent Cation:Proton Antiporter-2 (CPA2)	potassium/sodium ion:proton antiporter	677	75,657	13
93	NP_004162(SLC1A2)	P43004	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:aspartate/glutamate	574	62,104	9
94	NP_004163(SLC1A3)	P43003	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:glutamate	542	59,572	8
95	NP_005062(SLC1A6)	P48664	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:aspartate/glutamate	564	61,565	8
96	NP_005619(SLC1A5)	Q15758	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	neutral amino acid	541	56,598	8
97	NP_004161(SLC1A1)	P43005	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:excitatory amino acid	524	57,100	9
98	NP_006662(SLC1A7)	Q00341	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:glutamate	560	60,658	8
99	NP_003029(SLC1A4)	P43007	TD/UP	Dicarboxylate/Amino Acid:Cation Symporter (DAACS)	proton/sodium ion:neutral amino acid	532	55,723	10
100	NP_073740(SLC13A3)	Q8WWT9	TD/UP	Divalent Anion:Na ⁺ Symporter (DASS)	sodium ion:dicarboxylate/citrate symporter	602	66,841	14

Supplementary Table S1 continued. List and details of human secondary transport proteins (101-150).

Protein	UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
101 NP_003975(SLC13A2)	Q13183	TD/UP	Divalent Anion:Na ⁺ Symporter (DASS)	sodium ion:dicarboxylate/citrate symporter	592	64,410	15
102 NP_036582(SLC13A4)	Q9UKG4	TD/UP	Divalent Anion:Na ⁺ Symporter (DASS)	sodium ion:sulfate symporter	626	69,358	12
103 NP_071889(SLC13A1)	Q9B2V2	TD/UP	Divalent Anion:Na ⁺ Symporter (DASS)	sodium ion:sulfate symporter	594	66,037	13
104 NP_808218(SLC13A5)	Q86YT5	TD/UP	Divalent Anion:Na ⁺ Symporter (DASS)	sodium ion:dicarboxylate/citrate symporter	568	63,062	14
105 NP_005651(SLC35A2)	P78381	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-galactose	396	41,307	8
106 NP_005818(SLC35B1)	P78383	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-galactose	322	35,760	9
107 NP_006407(SLC35A1)	P78382	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	CMP-sialic acid	337	36,779	8
108 NP_036375(SLC35A3)	Q9Y2D2	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-N-acetylglucosamine	325	35,985	9
109 NP_061126(SLC35E3)	Q7Z769	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	phosphate:glucose-6-phosphate translocator	354	39,168	10
110 NP_060347(SLC35F6)	Q8N357	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	drug/metabolite?	371	40,214	9
111 NP_060415(SLC35A5)	Q9BS91	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-N-acetylglucosamine	424	48,500	9
112 NP_055954(SLC35D1)	Q9NTN3	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-glucuronic acid/UDP-N-acetylgalactosamine	355	39,240	8
113 NP_116215(SLC35B4)	Q969S0	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-N-acetylglucosamine	331	37423.5	10
114 NP_542401(SLC35A4)	Q96G79	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-galactose?	324	34,593	8
115 NP_060859(SLC35C1)	Q96A29	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	GDP-fucose	364	39,809	10
116 NP_079157(SLC35E1)	Q96K37*	TD	Drug/Metabolite Transporter (DMT) Superfamily	phosphate:glucose-6-phosphate translocator	266	30,218	6
117 NP_057032(SLC35B3)	Q9H1N7	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	UDP-galactose	401	44,593	8
118 NP_694958(SLC35G1)	Q2M3R5	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	drug/metabolite?	364	39,707	10
119 NP_079522(SLC35G2)	Q8TBE7	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	drug/metabolite?	412	46,422	10
120 NP_775271(SLC35C2)	Q9NQQ7-1	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	phosphate:phosphoenolpyruvate translocator	365	40,432	10
121 NP_775096(SLC35C2)	Q9NQQ7-2	TD/UP	Drug/Metabolite Transporter (DMT) Superfamily	phosphate:phosphoenolpyruvate translocator	344	38,154	8
122 NP_001523(SLC29A2)	Q14542	TD/UP	Equilibrative Nucleoside Transporter (ENT)	nucleoside	456	50,113	11
123 NP_060814(SLC29A3)	Q9BZD2	TD/UP	Equilibrative Nucleoside Transporter (ENT)	nucleoside	475	51,815	11
124 NP_004946(SLC29A1)	Q99808	TD/UP	Equilibrative Nucleoside Transporter (ENT)	equilibrative nucleoside transporter 1	456	50,219	11
125 NP_694979(SLC29A4)	Q7RTT9	TD/UP	Equilibrative Nucleoside Transporter (ENT)	plasma membrane monoamine transporter	530	58,059	11
126 NP_149093(Protein)	Q96JT2	TD/UP	Glycoside-Pentoside-Hexuronide (GPH):Cation Symporter	proton/sodium ion:sugar symporter	553	59,323	12
127 NP_057264(SLC45A2)	Q9UMX9	TD/UP	Glycoside-Pentoside-Hexuronide (GPH):Cation Symporter	proton/sodium ion:sugar symporter	530	58,268	12
128 NP_778148(MFSD12)	Q6NUT3	TD/UP	Glycoside-Pentoside-Hexuronide (GPH):Cation Symporter	proton/sodium ion:sugar symporter	471	51,030	11
129 NP_004861(MPDU1)	O75352	TD/UP	Lysosomal Cystine Transporter (LCT)	mannose-P-dichol utilization defect 2 protein	247	26,707	6
130 NP_004928(CTNS)	O60931	TD/UP	Lysosomal Cystine Transporter (LCT)	Cystinosis homolog	367	41,738	8
131 NP_001142(SLC25A4)	P12235	TD/UP	Mitochondrial Carrier (MC)	ADP:ATP translocase	297	33148.6	0
132 NP_001143(SLC25A5)	P05141	TD/UP	Mitochondrial Carrier (MC)	ADP:ATP translocase	298	32,852	0
133 NP_003942(SLC25A14)	O95258-1	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein homodog	325	36,202	0
134 NP_073721(SLC25A14)	O95258-2	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein homodog	322	35,958	0
135 NP_000378(SLC25A20)	O43772	TD/UP	Mitochondrial Carrier (MC)	caritine/acylcaritine	301	32,944	0
136 NP_004268(SLC25A27)	O95847*	TD	Mitochondrial Carrier (MC)	uncoupling protein homodog	134	14,896	0
137 NP_006349(SLC25A17)	O43808	TD/UP	Mitochondrial Carrier (MC)	peroxisomal adenine nucleotide	307	34,567	5
138 NP_002626(SLC25A3)	Q00322-2	TD/UP	Mitochondrial Carrier (MC)	phosphate	361	39,959	5
139 NP_005879(SLC25A3)	Q00322-1	TD/UP	Mitochondrial Carrier (MC)	phosphate	362	40,095	5
140 NP_055066(SLC25A13)	Q9UJS0	TD/UP	Mitochondrial Carrier (MC)	glutamate/aspartate	675	74,176	0
141 NP_055067(SLC25A15)	Q9Y619	TD/UP	Mitochondrial Carrier (MC)	ornithine	301	32,736	0
142 NP_057696(SLC25A37)	Q9NYZ2*	TD	Mitochondrial Carrier (MC)	iron	347	37,828	0
143 NP_057100(SLC25A39)	Q9BZJ4	TD/UP	Mitochondrial Carrier (MC)	?	351	38,564	0
144 NP_060625(SLC25A36)	Q96CQ1	TD/UP	Mitochondrial Carrier (MC)	pyrimidine nucleotides	310	34,095	1
145 NP_060345(SLC25A38)	A0A024R2L5	TD/UP	Mitochondrial Carrier (MC)	5-aminolevulinate/glycine	304	33,507	1
146 NP_061331(SLC25A40)	Q8TBP6	TD/UP	Mitochondrial Carrier (MC)	?	338	38,125	0
147 NP_068380(SLC25A19)	Q9HC21	TD/UP	Mitochondrial Carrier (MC)	deoxynucleotide	320	35,511	0
148 NP_068605(UCP1)	P25874	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein homodog	307	33,005	0
149 NP_003346(UCP2)	P55851	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein homodog	309	33,229	0
150 NP_078974(SLC25A22)	Q9H936	TD/UP	Mitochondrial Carrier (MC)	glutamate	323	34,470	4

Supplementary Table S1 continued. List and details of human secondary transport proteins (151-200).

	Protein	UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
151	NP_077008(SLC25A23)	Q9BV35-3	TD/UP	Mitochondrial Carrier (MC)	phosphate	482	54,035	0
152	NP_085134(SLC25A21)	Q9BQT8	TD/UP	Mitochondrial Carrier (MC)	2-oxodicarboxylate	299	33,303	0
153	NP_112581(SLC25A31)	Q9H0C2	TD/UP	Mitochondrial Carrier (MC)	ADP:ATP translocase	315	35,022	0
154	NP_113669(SLC25A18)	Q9H1K4	TD/UP	Mitochondrial Carrier (MC)	glutamate	315	33,849	5
155	NP_114153(SLC25A2)	Q9BXI2	TD/UP	Mitochondrial Carrier (MC)	ornithine	301	32,580	0
156	NP_115691(SLC25A33)	Q9BSK2	TD/UP	Mitochondrial Carrier (MC)	pyrimidine nucleotides	321	35,375	0
157	NP_219480(MCART1)	Q9H1U9	TD/UP	Mitochondrial Carrier (MC)	2-oxodicarboxylate	297	33,672	0
158	NP_112489(SLC25A28)	Q96A46-2	TD/UP	Mitochondrial Carrier (MC)	solute	177	20,045	0
159	NP_036272(SLC25A10)	Q9UBX3	TD/UP	Mitochondrial Carrier (MC)	dicarboxylate	287	31,282	0
160	NP_110407(MFTC)	Q9H2D1	TD/UP	Mitochondrial Carrier (MC)	folate	315	35,407	0
161	NP_003696(SLC25A12)	O75746	TD/UP	Mitochondrial Carrier (MC)	aspartate/glutamate (Ca ²⁺ -activated)	678	74,762	0
162	NP_003553(SLC25A11)	Q02978	TD/UP	Mitochondrial Carrier (MC)	2-oxoglutarate:malate antiporter	314	34,062	0
163	NP_005975(SLC25A1)	P53007	TD/UP	Mitochondrial Carrier (MC)	tricarboxylate	311	34,013	0
164	NP_660348(SLC25A43)	Q8WUT9	TD/UP	Mitochondrial Carrier (MC)	?	341	37,734	3
165	NP_689920(SLC25A16)	P16260	TD/UP	Mitochondrial Carrier (MC)	?	332	36,224	0
166	NP_775742(SLC25A26)	Q70HW3-2	TD/UP	Mitochondrial Carrier (MC)	S-adenosylmethionine	186	20,116	1
167	NP_775908(SLC25A41)	Q8N5S1*	TD	Mitochondrial Carrier (MC)	?	232	25,721	0
168	NP_001627(SLC25A6)	P12236	TD/UP	Mitochondrial Carrier (MC)	ADP:ATP translocase	298	32,866	0
169	NP_660325(SLC25A48)	Q6ZT89-3	TD/UP	Mitochondrial Carrier (MC)	carcarnitine/acylcarnitine	157	16,955	0
170	NP_003347(UCP3)-1	P55916	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein 3	312	34,216	0
171	NP_073714(UCP3)-2	P55916	TD/UP	Mitochondrial Carrier (MC)	uncoupling protein 3	275	29,783	0
172	NP_006753(LAPTM5)	Q13571	TD/UP	Multidrug Endosomal Transporter (MET)	lysosomal transporter protein homodog	262	29,937	4
173	NP_055528(LAPTM4A)	Q15012	TD/UP	Multidrug Endosomal Transporter (MET)	lysosomal transporter protein homodog	233	26,801	4
174	NP_060877(LAPTM4B)	Q86VI4-3	TD/UP	Multidrug Endosomal Transporter (MET)	lysosomal transporter protein homodog	317	35,123	4
175	NP_001458(SLC37A4)	Q43826	TD/UP	Major Facilitator Superfamily (MFS)	glucose-6-phosphate	429	46,360	11
176	NP_003044(SLC18A1)	P54219	TD/UP	Major Facilitator Superfamily (MFS)	vesicular monoamine	525	56,257	8
177	NP_003045(SLC18A2)	Q05940	TD/UP	Major Facilitator Superfamily (MFS)	vesicular monoamine	514	55,713	8
178	NP_003046(SLC18A3)	Q16572	TD/UP	Major Facilitator Superfamily (MFS)	vesicular acetylcholine	531	56,805	10
179	NP_003048(SLC22A1)	O15245-1	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	554	61,154	11
180	NP_694857(SLC22A1)	O15245-2	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	506	56,094	10
181	NP_003049(SLC22A2)	O15244	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	555	62,581	12
182	NP_003051(SLC22A5)	O76082	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	557	62,752	12
183	NP_001033(SLC2A4)	P14672	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT4	509	54,787	12
184	NP_003030(SLC2A5)	P22732	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT5	501	54,974	12
185	NP_000331(SLC2A2)	P11168	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT2	524	57,490	12
186	NP_004724(SLC33A1)	O00400	TD/UP	Major Facilitator Superfamily (MFS)	acetyl-CoA:CoA antiporter	549	60,909	10
187	NP_004247(SLC22A13)	Q9Y226	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	551	60,862	12
188	NP_004794(SLC22A14)	Q9Y267	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	594	66,684	12
189	NP_004687(SLC16A4)	O15374	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	487	54,022	12
190	NP_004686(SLC16A5)	O15375	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	505	54,994	12
191	NP_004685(SLC16A6)	O15403	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	523	57,393	12
192	NP_005065(SLC17A1)	Q14916	TD/UP	Major Facilitator Superfamily (MFS)	sodium ion:phosphate symporter	467	51,132	12
193	NP_005486(SLC17A4)	Q9Y2C5	TD/UP	Major Facilitator Superfamily (MFS)	sodium ion:phosphate symporter	497	54,055	12
194	NP_005826(SLC17A2)	O00624-2	TD/UP	Major Facilitator Superfamily (MFS)	sodium ion:phosphate symporter	436	47,350	9
195	NP_006508(SLC16A2)	P36021*	TD	Major Facilitator Superfamily (MFS)	monocarboxylate	613	66,401	12
196	NP_006507(SLC2A1)	P11166	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT1	492	54,084	12
197	NP_008862(SLC2A3)	P11169	TD/UP	Major Facilitator Superfamily (MFS)	glucose GLUT3	496	53,924	12
198	NP_036566(SLC17A5)	Q9NRA2	TD/UP	Major Facilitator Superfamily (MFS)	sodium ion:phosphate symporter	495	54,640	12
199	NP_037488(SLC16A8)	Q95907	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	504	52,319	12
200	NP_054772(FVCR)	Q9Y5Y0	TD/UP	Major Facilitator Superfamily (MFS)	Feline Leukemia Virus Subgroup C Receptor homolog	555	59,863	12

Supplementary Table S1 continued. List and details of human secondary transport proteins (201-250).

Protein		UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
201	NP_055663(SV2B)	Q7L1I2	TD/UP	Major Facilitator Superfamily (MFS)	synaptic veside protein SV2 homdog	683	77,444	11
202	NP_055664(SV2A)	Q7LOJ3	TD/UP	Major Facilitator Superfamily (MFS)	synaptic veside protein SV2 homdog	742	82,695	12
203	NP_060164(MFSD6)	Q6ZSS7	TD/UP	Major Facilitator Superfamily (MFS)	?	791	87,989	12
204	NP_060261(FLVCR2)	Q9UPI3	TD/UP	Major Facilitator Superfamily (MFS)	Feline Leukemia Virus Subgroup C Receptor homolog	526	57,241	12
205	NP_060954(SLC22A11)	Q9NSA0	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	550	59,972	12
206	NP_064425(SLC2A9)	Q9NRM0	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT9	540	58,702	12
207	NP_064705(SLC17A7)	Q9P2U7	TD/UP	Major Facilitator Superfamily (MFS)	vesicular glutamate (VGLUT1)	560	61,613	11
208	NP_065079(SLC17A6)	Q9P2U8	TD/UP	Major Facilitator Superfamily (MFS)	vesicular glutamate (VGLUT2)	582	64,392	11
209	NP_068812(SLC22A3)	O75751	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	556	61,280	12
210	NP_110404(SLC2A10)	O95528	TD/UP	Major Facilitator Superfamily (MFS)	sugar/metabdite? GLUT10	541	56,911	12
211	NP_115595(MFSD7)	Q6UXD7	TD/UP	Major Facilitator Superfamily (MFS)	Feline Leukemia Virus Subgroup C Receptor homolog	559	58,299	12
212	(FLJ14753)		TD	Major Facilitator Superfamily (MFS)	tetracycline efflux	282	30,401	6
213	(MGC11332)	Q8NBP5	TD/UP	Major Facilitator Superfamily (MFS)	?	474	50,630	12
214	NP_116228(DIRC2)	Q96SL1	TD/UP	Major Facilitator Superfamily (MFS)	?	478	52,088	12
215	NP_149040(TSCOT)	Q9BY10	TD/UP	Major Facilitator Superfamily (MFS)	thymic stromal cotransporter	475	51,067	11
216	NP_149116(SLC22A16)	Q86VW1	TD/UP	Major Facilitator Superfamily (MFS)	organic cation/camitine	577	64,614	12
217	NP_443117(SLC2A13)	Q96QE2*	TD/UP	Major Facilitator Superfamily (MFS)	proton:myo-inositol symporter GLUT13	629	68,206	12
218	NP_439896(SLC18B1)	Q6NT16	TD/UP	Major Facilitator Superfamily (MFS)	chromaffin granule monoamine	456	48,869	12
219	NP_542400(SLC46A1)	Q96NT5	TD/UP	Major Facilitator Superfamily (MFS)	proton:folate symporter	459	49,771	12
220	NP_061063(SLC16A10)	Q8TF71	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	515	55,493	12
221	NP_003042(SLC16A1)	P53985	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	500	53,944	11
222	NP_612440(MFSD3)	Q96ES6	TD/UP	Major Facilitator Superfamily (MFS)	?	412	42,696	12
223	NP_004781(SLC22A6)	Q4U2R8-1	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	563	61,816	11
224	NP_695008(SLC22A6)	Q4U2R8-2	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	550	60,318	11
225	NP_695009(SLC22A6)	Q4U2R8-3	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	506	55,858	10
226	NP_695010(SLC22A6)	Q4U2R8-4	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	519	57,357	10
227	NP_001111(TETTRAN)	Q14728	TD/UP	Major Facilitator Superfamily (MFS)	tetracycline efflux	455	48,339	12
228	NP_002546(SLC22A18)	Q96B11	TD/UP	Major Facilitator Superfamily (MFS)	organic cation	424	44,846	12
229	NP_647480(SLC17A8)	Q8NDX2	TD/UP	Major Facilitator Superfamily (MFS)	vesicular glutamate (VGLUT3)	589	64,991	11
230	NP_055395(SLC2A8)	Q9NY64	TD/UP	Major Facilitator Superfamily (MFS)	glucose/solute GLUT8	477	50,819	12
231	NP_061837(SLC37A1)	P57057	TD/UP	Major Facilitator Superfamily (MFS)	glycerol-3-phosphate	533	57,648	12
232	NP_057693(SLC22A17)	Q8WUG5*	TD	Major Facilitator Superfamily (MFS)	organic cation (brain type)	366	39,748	9
233	NP_065105(SLC22A17)	Q8WUG5	TD/UP	Major Facilitator Superfamily (MFS)	organic cation (brain type)	538	57,686	11
234	NP_543142(SLC22A9)	Q8IVM8	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	553	62,169	11
235	NP_660159(SLC2A12)	Q8TD20	TD/UP	Major Facilitator Superfamily (MFS)	sugar GLUT12	617	66966.3	12
236	NP_689740(SLC16A14)	Q7RTX9	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	510	56253.8	12
237	NP_689812(MFSD6L)	Q8IWD5	TD/UP	Major Facilitator Superfamily (MFS)	?	586	64008.6	11
238	NP_689991(MFSD8)	Q8NHS3	TD/UP	Major Facilitator Superfamily (MFS)	multidrug efflux?	518	57627.5	12
239	NP_699188(SLC16A11)	Q8NCK7	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	471	47790.9	11
240	NP_703150(SLC2A14)	Q8TDB8	TD/UP	Major Facilitator Superfamily (MFS)	glucose GLUT 14	520	56320.1	12
241	NP_060890(SLC22A15)	Q8IZD6	TD/UP	Major Facilitator Superfamily (MFS)	organic cation/camitine	535	59250.7	12
242	NP_061181(SVOP)	Q8N4V2	TD/UP	Major Facilitator Superfamily (MFS)	sugar/organic cation	548	60769.1	12
243	NP_149044(HIAT1)	Q96MC6	TD/UP	Major Facilitator Superfamily (MFS)	tetracycline efflux	490	53027.3	11
244	NP_004722(SLC16A7)	O60669	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	478	52200.2	11
245	NP_003050(SLC22A4)	Q9H015	TD/UP	Major Facilitator Superfamily (MFS)	organic cation/camitine	551	62155.1	12
246	NP_006663(SLC22A7)	Q9Y694-2	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	546	59810.4	12
247	NP_696961(SLC22A7)	Q9Y694*	TD	Major Facilitator Superfamily (MFS)	organic anion	235	25539.8	1
248	NP_004245(SLC22A8)	Q8TCC7	TD/UP	Major Facilitator Superfamily (MFS)	organic anion	542	59856.2	11
249	NP_110434(SLC2A11)	Q9BYW1*	TD	Major Facilitator Superfamily (MFS)	glucose/solute GLUT11	503	54546.4	12
250	NP_004198(SLC16A3)	O15427	TD/UP	Major Facilitator Superfamily (MFS)	monocarboxylate	465	49469.3	12

Supplementary Table S1 continued. List and details of human secondary transport proteins (251-300).

	Protein	UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
251	NP_006623(SLC17A3)	Q00476*	TD	Major Facilitator Superfamily (MFS)	sodium ion:phosphate symporter	401	44051.9	10
252	NP_653186(SLC22A12)	Q96S37	TD/UP	Major Facilitator Superfamily (MFS)	urate:anion exchanger 1	553	59630.2	11
253	NP_700357(SLC22A12)	B3KP53	TD/UP	Major Facilitator Superfamily (MFS)	urate:anion exchanger 1	332	35570.1	8
254	NP_115671(SLC37A3)	Q8NCC5-3	TD/UP	Major Facilitator Superfamily (MFS)	glycerol-3-phosphate	443	48930.9	7
255	NP_060712(SLC47A1)	Q96FL8	TD/UP	Multidrug/Oligosaccharidyl-lipid/Polysaccharide (MOP) Flippase	MATE 1 multidrug efflux	570	61922.1	13
256	NP_690872(SLC47A2)	Q86VL8	TD/UP	Multidrug/Oligosaccharidyl-lipid/Polysaccharide (MOP) Flippase	MATE 2 multidrug efflux	602	65084.5	13
257	NP_112233(SFXN3)	Q9BWM7	TD/UP	Mitochondrial Tricarboxylate Carrier (MTC)	tricarboxylates (Sideroflexin-3)	325	35978.9	4
258	NP_653180(SFXN5)	Q8TD22	TD/UP	Mitochondrial Tricarboxylate Carrier (MTC)	tricarboxylates (Sideroflexin-5)	340	37124.2	2
259	NP_073591(SFXN1)	Q9H9B4	TD/UP	Mitochondrial Tricarboxylate Carrier (MTC)	tricarboxylates (Sideroflexin-1)	322	35619.4	4
260	NP_005107(SLC23A2)	Q9UGH3	TD/UP	Nucleobase:Cation Symporter-2 (NCS2)	sodium ion:L-ascorbic acid symporter	650	70336.9	12
261	NP_653313(SLC23A3)	Q6PIS1	TD/UP	Nucleobase:Cation Symporter-2 (NCS2)	sodium ion:L-ascorbic acid symporter	419	44583.8	7
262	NP_005838(SLC23A1)	Q9UHI7-1	TD/UP	Nucleobase:Cation Symporter-2 (NCS2)	sodium ion:L-ascorbic acid symporter	598	64815.1	11
263	NP_689898(SLC23A1)	Q9UHI7-2	TD/UP	Nucleobase:Cation Symporter-2 (NCS2)	sodium ion:L-ascorbic acid symporter	602	65221.6	11
264	NP_000569(SLC11A1)	P49279	TD/UP	Metal ion transporter (Nramp)	divalent metal ion	550	59900.3	12
265	NP_000608(SLC11A2)	P49281-2	TD/UP	Metal ion transporter (Nramp)	divalent metal ion	561	61455.8	12
266	NP_003033(SLC6A1)	P30531	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:GABA	599	67104.6	12
267	NP_001035(SLC6A3)	Q01959	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion:dopamine symporter	620	68494.9	12
268	NP_001036(SLC6A4)	P31645	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion:serotonin symporter	630	70324.8	12
269	NP_003034(SLC6A6)	P31641	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:taurine	619	69675.9	12
270	NP_001034(SLC6A2)	P23975	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion:noradrenaline symporter	617	69332	12
271	NP_004202(SLC6A5)	Q9Y345	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:glycine	797	87359.8	12
272	NP_005620(SLC6A8)	P48029	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:creatine	635	70522.7	12
273	NP_009162(SLC6A14)	Q9UN76	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:amino acid	642	72152.8	12
274	NP_055044(SLC6A11)	P48066	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:GABA	632	70605.8	12
275	NP_055043(SLC6A7)	Q99884	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion:brain-specific L-proline symporter	636	70892.5	12
276	NP_054756(SLC6A16)	Q9GZN6	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:neurotransmitter	737	82226.9	14
277	NP_064593(SLC6A20)	Q9NP91-1	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:neurotransmitter	592	65914	12
278	NP_071800(SLC6A20)	Q9NP91-2	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:neurotransmitter	555	61750.9	10
279	NP_003035(SLC6A12)	P48065	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride ion:betaine/GABA	614	69416.3	12
280	NP_057699(SLC6A13)	Q9NSD5	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride:betaine/GABA	602	68008.8	11
281	NP_060527(SLC6A15)	Q9H2J7	TD/UP	Neurotransmitter:Sodium Symporter (NSS)	sodium ion/chloride:betaine/GABA	289	32264	5
282	NP_008865(SLC6A9)	P48067*	TD	Neurotransmitter:Sodium Symporter (NSS)	sodium/chloride ion:glycine symporter	638	71044.9	12
283	NP_005621(SLC02A1)	Q92959	TD/UP	Organo Anion Transporter (OAT)	prostaglandin/organic anion	643	70116.3	12
284	NP_009187(SLC02B1)	Q94956	TD/UP	Organo Anion Transporter (OAT)	organic anion	709	76698.6	12
285	NP_037404(SLC03A1)	Q9UIG8	TD/UP	Organo Anion Transporter (OAT)	organic anion	710	76588.9	12
286	NP_059131(SLC01C1)	Q9NYB5	TD/UP	Organo Anion Transporter (OAT)	organic anion	712	78696.4	12
287	NP_062818(SLC01B3)	Q9NPD5	TD/UP	Organo Anion Transporter (OAT)	organic anion	702	77402.9	12
288	NP_112220(SLC05A1)	Q9H2Y9	TD/UP	Organo Anion Transporter (OAT)	organic anion	848	91878	12
289	NP_005066(SLC01A2)	P46721-2	TD/UP	Organo Anion Transporter (OAT)	organic anion	579	64368.5	11
290	NP_066580(SLC01A2)	P46721-1	TD/UP	Organo Anion Transporter (OAT)	organic anion	670	74144.9	12
291	NP_602307(SLC01A2)	P46721	TD/UP	Organo Anion Transporter (OAT)	organic anion	670	74144.9	12
292	NP_006437(SLC01B1)	Q9Y6L6	TD/UP	Organo Anion Transporter (OAT)	organic anion	691	76449.7	12
293	NP_057438(SLC04A1)	Q96BD0	TD/UP	Organo Anion Transporter (OAT)	organic anion	722	77193.3	12
294	NP_775759(SLC06A1)	Q86UG4	TD/UP	Organo Anion Transporter (OAT)	organic anion (testis-specific)	719	79196.4	12
295	NP_689885(SLC51A)	Q86UW1	TD/UP	Organic Solute Transporter (OST)	organic solute (alpha subunit)	340	37749	7
296	NP_849190(SLC51B)	Q86UW2	TD/UP	Organic Solute Transporter (OST)	organic solute (beta subunit)	128	14319.2	1
297	NP_005006(OXA1L)	J3KNA0	TD/UP	Cytochrome Oxidase Biogenesis (Oxa1)	60 kDa inner membrane protein OxaA homolog	495	55297.9	5
298	NP_006740(SLC20A2)	Q08357	TD/UP	Inorganic Phosphate Transporter (PiT)	phosphate (gibbon ape leukemia virus receptor homolog)	652	70392.4	9
299	NP_005406(SLC20A1)	Q8WUM9	TD/UP	Inorganic Phosphate Transporter (PiT)	phosphate (gibbon ape leukemia virus receptor homolog)	679	73699.6	12
300	NP_003043(SLC34A1)	Q06495	TD/UP	Phosphate/Na ⁺ Symporter (PNaS)	sodium ion:phosphate symporter 2C	639	68921.3	8

Supplementary Table S1 continued. List and details of human secondary transport proteins (301-336).

Protein		UniProtKB ^a	Source ^b	Transporter family ^c	Substrate(s)/Function ^d	AA ^e	MW (Da) ^f	TM ^g
301	NP_006415(SLC34A2)	Q95436	TD/UP	Phosphate:Na ⁺ Symporter (PNaS)	sodium ion:phosphate symporter 2C	690	75761.3	12
302	NP_005064(SLC15A1)	P46059	TD/UP	Proton-dependent Oligopeptide Transporter (POT)	oligopeptide:proton	708	78805.8	11
303	NP_057666(SLC15A3)	Q8IY34	TD/UP	Proton-dependent Oligopeptide Transporter (POT)	peptide/histidine:proton	581	63559.5	12
304	NP_066568(SLC15A2)	Q16348	TD/UP	Proton-dependent Oligopeptide Transporter (POT)	oligopeptide:proton	729	81753.4	12
305	NP_663623(SLC15A4)	Q8N697	TD/UP	Proton-dependent Oligopeptide Transporter (POT)	oligopeptide:proton	577	62033.5	12
306	NP_064546(C2orf83)	Q53S99*	TD	Reduced Folate Carrier (RFC)	thiamine/folate?	140	15085.3	1
307	NP_079519(SLC19A3)	Q9BZV2	TD/UP	Reduced Folate Carrier (RFC)	folate	496	55664.7	12
308	NP_008927(SLC19A2)	Q60779	TD/UP	Reduced Folate Carrier (RFC)	thiamine/folate	497	55400	12
309	NP_000334(SLC5A1)	P13866	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:glucose symporter	664	73498	14
310	NP_003032(SLC5A2)	P31639	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:glucose symporter	672	72896.7	14
311	NP_000444(SLC5A5)	Q92911	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:iodide symporter	643	68666.3	13
312	NP_008864(SLC5A3)	P53794	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:myo-inositol symporter	718	79679.9	14
313	NP_066918(SLC5A6)	Q9Y289	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:multivitamin symporter	635	68702	13
314	NP_068587(SLC5A7)	Q9GZV3	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:choline symporter	580	63203.6	13
315	NP_055042(SLC5A4)	Q9NY91	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:glucose symporter	659	72455.5	14
316	NP_443176(SLC5A11)	Q8VWX8	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:glucose symporter	675	74036.3	13
317	NP_666018(SLC5A8)	Q8N695	TD/UP	Solute:Sodium Symporter (SSS)	sodium ion:iodide symporter	610	66573.5	13
318	NP_689564(SLC5A10)	A0PJK1*	TD	Solute:Sodium Symporter (SSS)	sodium ion:glucose symporter	566	61613.2	11
319	NP_000432(SLC26A4)	Q43511	TD/UP	Sulfate Permease (SuP)	chloride anion exchanger/Pendrin homolog	780	85723	12
320	NP_000102(SLC26A3)	P40879	TD/UP	Sulfate Permease (SuP)	chloride anion exchanger	764	84504.9	12
321	NP_000103(SLC26A2)	P50443	TD/UP	Sulfate Permease (SuP)	sulfate:anion exchanger	739	81649.4	12
322	NP_075062(SLC26A6)	Q9BXS9*	TD	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	738	80910.4	11
323	NP_599025(SLC26A6)	Q9BXS9-3	TD/UP	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	737	80782.3	11
324	NP_602298(SLC26A6)	Q9BXS9*	TD	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	719	78751.1	8
325	NP_439897(SLC26A7)	Q8TE54-1	TD/UP	Sulfate Permease (SuP)	sulfate:anion exchanger	656	72212.8	8
326	NP_599028(SLC26A7)	Q8TE54-2	TD/UP	Sulfate Permease (SuP)	sulfate:anion exchanger	663	73032.9	8
327	NP_443166(SLC26A9)	Q7LBE3-2	TD/UP	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	791	86988.3	12
328	NP_599152(SLC26A9)	Q7LBE3*	TD	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	887	97188.8	13
329	NP_443193(SLC26A8)	Q96RN1-1	TD/UP	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	970	109005.6	12
330	NP_619732(SLC26A8)	Q96RN1-2	TD/UP	Sulfate Permease (SuP)	anion exchange (Prestin homolog)	865	97384.6	8
331	NP_597996(SLC26A10)	Q8NG04*	TD	Sulfate Permease (SuP)	sulfate:anion exchanger	202	21333.3	0
332	NP_071325(SLC26A1)	Q9H2B4-1	TD/UP	Sulfate Permease (SuP)	sulfate:anion exchanger	701	75015.6	12
333	NP_602297(SLC26A1)	Q9H2B4-2	TD/UP	Sulfate Permease (SuP)	sulfate:anion exchanger	224	24961.8	4
334	NP_775897(SLC26A11)	Q86WA9*	TD	Sulfate Permease (SuP)	sulfate:anion exchanger	589	63713.3	10
335	NP_055394(SLC39A2)	Q9NP94	TD/UP	Zinc-Iron Permease (ZIP)	zinc/iron	309	32751.3	8
336	NP_055252(SLC39A1)	Q9NY26	TD/UP	Zinc-Iron Permease (ZIP)	zinc/iron	324	34249.6	8

^aAccession number in the UniProt protein KnowledgeBase (www.uniprot.org). ^{*}An isoform of this protein not specified in the database

^bSource of the exact sequence used in the AAC analysis

TD/UP = sequence taken from the Transporter Protein Analysis Database and matches exactly a sequence in UniProt with the given accession number

TD = sequence taken from the Transporter Protein Analysis Database that is an isoform of a protein in UniProt with the given accession number

UP = sequence taken from Uniprot

^cTransporter Family classification taken from the Transporter Protein Analysis Database (www.membranetransport.org) as of December 2015

^dExperimentally determined or putative substrate(s) or function taken from the Transporter Protein Analysis Database (www.membranetransport.org) or from the UniProt protein KnowledgeBase (www.uniprot.org) as of December 2015.

^eNumber of amino acid residues in the protein determined from the protein sequence using the ExPASy ProtParam tool (www.expasy.org/protparam).

^fMolecular weight of the protein in Daltons determined from the protein sequence using the ExPASy ProtParam tool (www.expasy.org/protparam).

^gPutative number of transmembrane-spanning α -helices in the protein predicted by the tool TOPCONS (<http://topcons.cbr.su.se/>).

Supplementary Table S2. Amino acid composition of human secondary transport proteins (1-50).

			Amino acid																			Combinations of amino acids						
	Protein	Family	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob	Pos	Neg	Pos - Neg	OH	NH
1	NP_006832(SLC38A3)	AAAP	7.50%	2.40%	4.00%	1.40%	1.60%	2.80%	4.60%	6.20%	2.20%	8.10%	13.10%	4.00%	4.00%	7.10%	6.00%	7.70%	5.80%	0.60%	4.00%	7.10%	42.90%	6.40%	6.00%	0.40%	13.50%	6.80%
2	NP_060701(SLC38A7)	AAAP	10.60%	3.20%	1.90%	3.20%	2.60%	3.20%	4.30%	8.40%	0.40%	8.00%	10.40%	2.60%	2.60%	5.80%	4.50%	6.10%	6.10%	2.60%	2.80%	10.40%	45.20%	5.80%	7.50%	-1.70%	12.20%	5.10%
3	NP_277053(SLC38A5)	AAAP	8.30%	3.20%	2.10%	1.70%	2.50%	3.20%	3.40%	7.60%	1.90%	7.20%	14.00%	3.00%	4.40%	6.60%	5.50%	8.50%	4.20%	0.80%	3.40%	8.50%	44.60%	6.20%	5.10%	1.10%	12.70%	5.30%
4	NP_510968(SLC36A1)	AAAP	4.80%	3.40%	4.60%	2.70%	2.70%	2.70%	3.40%	6.30%	2.10%	9.00%	14.30%	2.30%	2.50%	6.90%	5.50%	8.00%	5.50%	1.10%	4.00%	8.20%	43.20%	5.70%	6.10%	-0.40%	13.50%	7.30%
5	NP_542119(SLC32A1)	AAAP	9.70%	3.20%	3.00%	3.40%	2.20%	2.70%	5.00%	8.60%	2.30%	6.30%	12.00%	4.20%	2.50%	6.30%	4.00%	6.50%	3.80%	1.90%	3.00%	8.40%	42.70%	7.40%	8.40%	-1.00%	10.30%	5.70%
6	NP_060488(SLC38A4)	AAAP	6.40%	2.20%	4.80%	3.50%	0.70%	1.30%	4.90%	6.80%	2.40%	8.80%	12.20%	4.90%	4.00%	6.40%	4.90%	8.60%	4.40%	0.70%	4.60%	7.50%	41.30%	7.10%	8.40%	-1.30%	13.00%	6.10%
7	NP_612637(MGC15523)	AAAP	9.10%	4.40%	1.90%	3.20%	1.80%	5.10%	6.40%	10.30%	1.80%	3.30%	10.10%	4.00%	3.50%	4.90%	9.00%	7.20%	3.60%	0.80%	1.40%	8.30%	35.70%	8.40%	9.60%	-1.20%	10.80%	7.00%
8	NP_061849(SLC38A2)	AAAP	6.70%	2.20%	4.30%	2.40%	1.20%	1.80%	3.80%	5.90%	2.40%	7.70%	14.60%	4.30%	3.20%	6.70%	4.00%	9.90%	5.50%	0.80%	4.50%	8.10%	43.80%	6.50%	6.20%	0.30%	15.40%	6.10%
9	NP_109599(SLC38A1)	AAAP	4.90%	2.50%	4.70%	3.00%	2.50%	2.10%	4.60%	4.90%	1.70%	7.40%	12.00%	5.90%	3.40%	7.40%	3.40%	9.70%	8.00%	0.90%	3.00%	8.00%	39.70%	8.40%	7.60%	0.80%	17.70%	6.80%
10	NP_689526(SLC36A4)	AAAP	5.60%	2.80%	3.80%	2.60%	2.20%	3.60%	5.00%	6.30%	2.20%	9.30%	11.90%	4.40%	2.60%	6.70%	4.80%	7.50%	5.40%	1.20%	3.20%	9.10%	42.60%	7.20%	7.60%	-0.40%	12.90%	7.40%
11	NP_722518(SLC38A6)	AAAP	7.00%	2.00%	3.30%	2.20%	1.80%	2.00%	3.70%	6.10%	1.50%	8.80%	14.90%	4.40%	2.90%	9.00%	3.90%	8.80%	4.80%	1.50%	4.20%	7.20%	46.90%	6.40%	5.90%	0.50%	13.60%	5.30%
12	NP_775783(FLJ39822)	AAAP	4.70%	2.10%	3.60%	2.90%	3.10%	2.90%	3.10%	6.80%	2.30%	8.60%	12.00%	2.60%	2.90%	8.60%	3.90%	7.60%	8.60%	0.80%	3.10%	9.90%	43.80%	4.70%	6.00%	-1.30%	16.20%	6.50%
13	NP_775785(SLC38A9)	AAAP	4.50%	3.20%	5.30%	3.40%	2.10%	2.70%	2.90%	5.90%	3.00%	9.30%	11.10%	3.20%	3.40%	8.40%	5.30%	7.70%	5.90%	1.60%	4.50%	6.80%	40.10%	6.40%	6.30%	0.10%	13.60%	8.00%
14	NP_000333(SLC4A1)	AE	6.90%	4.90%	1.60%	4.50%	0.50%	4.50%	7.10%	6.80%	2.00%	5.40%	14.90%	3.20%	2.60%	6.00%	6.10%	6.40%	4.70%	1.20%	2.50%	7.90%	41.10%	8.10%	11.60%	-3.50%	11.10%	6.10%
15	NP_003750(SLC4A4)	AE	6.40%	4.00%	3.30%	6.10%	1.40%	2.50%	5.30%	5.80%	2.10%	6.50%	11.40%	6.80%	3.10%	6.60%	5.90%	7.50%	5.70%	1.30%	2.30%	6.10%	37.00%	10.80%	11.40%	-0.60%	13.20%	5.80%
16	NP_071341(SLC4A10)	AE	5.50%	5.10%	2.60%	5.30%	2.00%	3.00%	7.30%	6.20%	3.20%	6.80%	11.20%	5.50%	2.70%	5.10%	5.50%	7.60%	4.90%	1.70%	2.00%	6.60%	35.20%	10.60%	12.60%	-2.00%	12.50%	5.60%
17	NP_114423(SLC4A11)	AE	8.10%	5.10%	3.60%	4.20%	1.60%	3.40%	4.80%	5.70%	2.60%	5.90%	14.00%	4.00%	2.70%	5.20%	4.70%	7.20%	6.40%	1.00%	3.70%	6.20%	39.40%	9.10%	9.00%	0.10%	13.60%	7.00%
18	NP_597812(SLC4A5)	AE	6.00%	4.80%	2.70%	5.40%	1.70%	3.40%	5.10%	8.50%	2.40%	7.60%	10.90%	5.90%	2.50%	5.70%	6.20%	7.40%	4.90%	1.60%	2.10%	5.30%	35.50%	10.70%	10.50%	0.20%	12.30%	6.10%
19	NP_067019(SLC4A5)	AE	5.90%	4.70%	2.60%	5.40%	1.70%	3.40%	5.10%	8.60%	2.40%	7.60%	10.80%	6.10%	2.60%	5.70%	6.20%	7.40%	4.90%	1.60%	2.10%	5.20%	35.20%	10.80%	10.50%	0.30%	12.30%	6.00%
20	NP_003606(SLC4A7)	AE	5.60%	5.20%	2.40%	5.40%	1.60%	2.30%	7.20%	6.10%	3.00%	5.80%	11.90%	6.30%	2.20%	5.00%	6.30%	8.30%	5.40%	1.20%	2.10%	6.70%	35.00%	11.50%	12.60%	-1.10%	13.70%	4.70%
21	NP_003031(SLC4A2)	AE	8.50%	7.10%	1.60%	4.10%	0.80%	3.70%	8.50%	7.70%	2.90%	4.20%	11.90%	3.60%	2.30%	5.00%	7.30%	6.70%	4.80%	0.80%	1.40%	7.00%	36.60%	10.70%	12.60%	-1.90%	11.50%	5.30%
22	NP_113655(SLC4A9)	AE	8.00%	5.80%	1.90%	3.50%	2.00%	3.90%	5.60%	7.50%	2.10%	3.80%	15.90%	3.00%	2.00%	5.10%	8.60%	7.00%	4.70%	1.90%	1.80%	5.90%	38.70%	8.80%	9.10%	-0.30%	11.70%	5.80%
23	NP_004849(SLC4A8)	AE	5.80%	4.50%	2.40%	4.60%	2.30%	3.20%	6.80%	6.50%	3.80%	6.70%	11.50%	5.50%	2.90%	4.90%	5.50%	6.40%	5.40%	1.50%	2.50%	7.40%	36.30%	10.00%	11.40%	-1.40%	11.80%	5.60%
24	NP_005061(SLC4A3)	AE	7.30%	6.70%	1.30%	4.80%	0.60%	2.80%	7.60%	7.40%	3.10%	3.80%	13.00%	4.10%	1.90%	4.40%	9.20%	7.80%	5.00%	1.10%	1.50%	6.80%	35.30%	10.80%	12.40%	-1.60%	12.80%	4.10%
25	NP_003036(SLC7A1)	APC	10.00%	2.90%	3.80%	3.70%	2.40%	2.20%	4.10%	8.60%	0.50%	6.50%	12.90%	3.80%	3.00%	5.70%	4.10%	7.00%	5.60%	1.60%	2.70%	8.90%	44.00%	6.70%	7.80%	-1.10%	12.60%	6.00%
26	NP_003037(SLC7A2)	APC	10.70%	4.00%	2.40%	2.70%	2.00%	2.60%	4.00%	7.20%	1.10%	5.20%	13.20%	3.20%	3.00%	6.80%	4.40%	8.40%	5.60%	1.50%	3.80%	8.20%	44.10%	7.20%	6.70%	0.50%	14.00%	5.00%
27	NP_004164(SLC7A4)	APC	10.80%	3.60%	1.70%	2.40%	1.40%	3.10%	3.10%	8.50%	2.50%	4.60%	15.60%	1.30%	2.50%	5.50%	7.50%	8.30%	4.60%	2.00%	3.10%	7.70%	44.20%	4.90%	5.50%	-0.60%	12.90%	4.80%
28	NP_036376(SLC7A8)	APC	7.70%	2.40%	3.60%	2.20%	2.10%	3.00%	5.00%	9.30%	0.90%	7.70%	11.80%	3.90%	2.20%	6.00%	6.00%	5.60%	5.00%	2.10%	3.70%	9.70%	42.90%	6.30%	7.20%	-0.90%	10.60%	6.60%
29	NP_055085(SLC7A9)	APC	8.40%	2.90%	3.10%	1.40%	2.10%	2.50%	4.30%	7.20%	0.60%	11.10%	11.70%	3.70%	2.30%	5.50%	5.50%	7.20%	5.70%	1.60%	4.90%	8.20%	44.90%	6.60%	5.70%	0.90%	12.90%	5.60%
30	NP_055146(SLC7A11)	APC	6.60%	4.00%	2.80%	1.60%	1.40%	2.00%	4.20%	7.60%	1.20%	10.00%	12.40%	4.20%	2.80%	6.80%	5.40%	7.00%	6.20%	1.40%	3.60%	9.00%	44.80%	8.20%	5.80%	2.40%	13.20%	4.80%
31	NP_062823(SLC7A10)	APC	7.50%	3.40%	3.10%	1.10%	2.50%	2.10%	3.60%	9.00%	1.90%	6.70%	12.60%	2.30%	2.70%	6.30%	7.30%	8.00%	5.70%	2.10%	3.30%	8.80%	41.90%	5.70%	4.70%	1.00%	13.70%	5.20%
32	NP_003477(SLC7A5)	APC	9.50%	2.40%	3.40%	1.40%	2.40%	2.00%	4.50%	7.90%	0.80%	7.30%	14.00%	4.10%	2.00%	6.50%	5.30%	6.70%	5.30%	2.00%	3.20%	9.50%	46.80%	6.50%	5.90%	0.60%	12.00%	5.40%
33	NP_620172(SLC7A13)	APC	6.80%	3.00%	2.80%	1.70%	2.30%	2.60%	3.00%	5.70%	0.90%	9.60%	15.70%	4.00%	1.70%	6.80%	4.90%	9.80%	5.10%	2.10%	3.80%	7.70%	46.60%	7.00%	4.70%	2.30%	14.90%	5.40%
34	NP_003973(SLC7A7)	APC	8.80%	3.30%	2.90%	3.10%	2.30%	2.20%	4.30%	7.20%	0.80%	9.80%	11.90%	2.70%	2.00%	6.70%	5.10%	8.40%	4.10%	1.40%	4.70%	8.20%	45.40%	6.00%	7.40%	-1.40%	12.50%	5.10%
35	NP_116192(SLC7A3)	APC	9.40%	3.70%	1.60%	2.40%	1.60%	2.70%	4.40%	8.20%	1.30%	6.00%	15.00%	2.10%	2.70%	5.20%	4.70%	7.90%	6.10%	1.90%	3.70%	9.20%	44.80%	5.80%	6.80%	-1.00%	14.00%	4.30%
36	NP_000266(OCA2)	ArsB	9.30%	6.10%	2.50%	3.10%	1.80%	3.20%	5.70%	6.30%	3.20%	6.30%	14.60%	2.30%	2.60%	4.50%	4.30%	7.60%	4.50%	2.00%	1.90%	8.00%	42.70%	8.40%	8.80%	-0.40%	12.10%	5.70%
37	NP_003040(SLC10A1)	BASS	6.90%	2.30%	3.40%	2.00%	4.00%	1.40%	2.90%	8.00%	0.60%	8.60%	13.80%	6.00%	5.20%	6.30%	5.70%	6.00%	6.30%									

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (51-100).

			Amino acid																			Combinations of amino acids						
	Protein	Family	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
51	NP_000330(SLC12A3)	CCC	8.00%	4.70%	4.00%	4.00%	1.90%	2.90%	4.60%	7.90%	2.10%	8.10%	9.90%	4.40%	2.40%	5.20%	5.10%	7.30%	5.50%	1.90%	3.30%	6.80%	38.00%	9.10%	8.60%	0.50%	12.80%	6.90%
52	NP_000329(SLC12A1)	CCC	8.60%	3.90%	5.60%	4.10%	2.00%	2.60%	5.70%	7.60%	1.50%	8.30%	8.80%	5.90%	2.40%	5.40%	3.50%	6.80%	5.30%	1.50%	3.10%	7.30%	38.40%	9.80%	9.80%	0.00%	12.10%	8.20%
53	NP_005063(SLC12A4)	CCC	7.90%	5.30%	3.20%	4.30%	1.80%	2.60%	5.80%	7.60%	2.30%	5.80%	12.10%	3.50%	3.40%	4.20%	4.40%	6.70%	5.40%	1.80%	3.70%	7.80%	37.80%	8.80%	10.10%	-1.30%	12.10%	5.80%
54	NP_006589(SLC12A7)	CCC	8.80%	4.70%	4.20%	3.30%	2.00%	3.60%	5.90%	8.00%	1.90%	5.30%	11.00%	3.80%	3.70%	4.60%	4.50%	6.60%	5.70%	1.70%	2.80%	7.80%	37.50%	8.50%	9.20%	-0.70%	12.30%	7.80%
55	NP_064631(SLC12A9)	CCC	11.20%	5.50%	2.40%	3.60%	1.30%	2.40%	3.00%	11.70%	1.40%	2.50%	16.20%	1.50%	1.80%	4.50%	6.70%	7.30%	4.60%	1.30%	2.80%	8.30%	42.70%	7.00%	6.60%	0.40%	11.90%	4.80%
56	NP_065759(SLC12A5)	CCC	6.50%	5.00%	4.60%	3.60%	2.20%	2.70%	6.90%	8.60%	2.00%	5.70%	10.50%	4.10%	3.70%	4.20%	4.60%	7.20%	5.90%	1.80%	2.80%	7.40%	34.30%	9.10%	10.50%	-1.40%	13.10%	7.30%
57	NP_078904(SLC12A8)	CCC	6.70%	3.60%	2.50%	2.70%	2.00%	5.20%	5.20%	9.10%	1.40%	4.80%	13.60%	2.70%	3.10%	5.90%	4.80%	9.10%	5.20%	2.00%	2.80%	7.80%	38.80%	6.30%	7.90%	-1.60%	14.30%	7.70%
58	NP_005126(SLC12A6)	CCC	8.10%	4.20%	4.50%	3.60%	1.70%	2.90%	6.20%	7.20%	2.40%	6.60%	11.20%	5.00%	3.70%	4.80%	3.60%	7.00%	5.50%	1.60%	2.90%	7.30%	38.00%	9.20%	9.80%	-0.60%	12.50%	7.40%
59	NP_006336(SLC30A9)	CDF	7.00%	6.70%	3.70%	3.50%	1.90%	3.70%	7.70%	7.00%	1.80%	4.90%	11.60%	5.60%	2.30%	3.90%	3.90%	8.30%	5.10%	1.10%	3.00%	7.20%	34.60%	12.30%	11.20%	1.10%	13.40%	7.40%
60	NP_061183(SLC30A10)	CDF	6.20%	2.50%	3.80%	5.40%	4.20%	3.80%	5.80%	6.20%	4.20%	8.30%	11.20%	5.40%	2.10%	2.10%	5.40%	8.30%	3.80%	0.80%	2.50%	7.90%	35.70%	7.90%	11.20%	-3.30%	12.10%	7.60%
61	NP_067017(SLC30A1)	CDF	6.20%	2.50%	3.80%	5.40%	4.20%	3.80%	5.80%	6.20%	4.20%	8.30%	11.20%	5.40%	2.10%	2.10%	5.40%	8.30%	3.80%	0.80%	2.50%	7.90%	35.70%	7.90%	11.20%	-3.30%	12.10%	7.60%
62	NP_598003(SLC30A7)	CDF	7.20%	3.20%	2.90%	4.80%	1.60%	4.30%	2.90%	8.50%	7.20%	7.70%	12.20%	2.70%	1.90%	7.40%	3.50%	8.80%	2.90%	1.30%	2.10%	6.90%	41.40%	5.90%	7.70%	-1.80%	11.70%	7.20%
63	NP_037441(SLC30A4)	CDF	7.90%	4.70%	4.00%	6.10%	1.60%	3.50%	4.20%	5.60%	3.00%	7.00%	12.80%	4.20%	2.80%	3.70%	3.00%	9.60%	4.90%	1.20%	2.80%	7.50%	38.90%	8.90%	10.30%	-1.40%	14.50%	7.50%
64	NP_003450(SLC30A3)	CDF	11.30%	5.70%	0.80%	2.80%	2.10%	2.60%	6.20%	7.50%	4.40%	2.60%	13.90%	1.00%	3.10%	4.10%	7.70%	8.20%	5.90%	1.00%	2.60%	6.40%	38.30%	6.70%	9.00%	-2.30%	14.10%	3.40%
65	NP_060434(SLC30A6)	CDF	6.50%	5.40%	4.80%	2.80%	1.30%	2.60%	3.30%	6.90%	2.40%	6.30%	13.20%	2.60%	2.60%	6.50%	6.30%	7.60%	7.80%	1.30%	2.80%	6.90%	39.40%	8.00%	6.10%	1.90%	15.40%	7.40%
66	NP_176250(SLC30A8)	CDF	9.50%	3.00%	2.20%	4.10%	3.30%	3.30%	5.40%	4.10%	3.80%	7.60%	12.50%	4.90%	2.40%	4.10%	3.50%	9.50%	4.30%	1.40%	2.70%	8.70%	42.40%	7.90%	9.50%	-1.60%	13.80%	5.50%
67	NP_115902(SLC30A2)	CDF	9.00%	2.80%	1.50%	5.00%	2.20%	5.60%	5.00%	7.70%	4.60%	7.40%	11.10%	3.70%	2.50%	2.80%	3.70%	6.50%	5.60%	1.20%	2.80%	9.30%	39.60%	6.50%	10.00%	-3.50%	12.10%	7.10%
68	NP_075053(SLC30A5)	CDF	6.80%	2.50%	1.70%	3.80%	2.10%	2.90%	3.80%	8.60%	5.10%	8.00%	12.50%	4.60%	3.00%	7.30%	3.00%	8.90%	4.40%	1.00%	2.20%	7.70%	42.30%	7.10%	7.60%	-0.50%	13.30%	4.60%
69	NP_000074(CLCN1)	CIC	7.40%	4.00%	1.50%	4.10%	1.80%	4.60%	6.30%	7.70%	2.50%	4.80%	11.30%	4.30%	2.80%	5.10%	7.30%	7.70%	5.40%	1.40%	2.60%	7.40%	36.00%	8.30%	10.40%	-2.10%	13.10%	6.10%
70	NP_001821(CLCN4)	CIC	7.50%	5.50%	3.20%	4.30%	2.10%	1.80%	5.40%	7.40%	1.80%	6.30%	11.10%	3.70%	3.00%	5.40%	4.70%	6.60%	6.10%	2.50%	3.60%	8.00%	38.30%	9.20%	9.70%	-0.50%	12.70%	5.00%
71	NP_000075(CLCN5)	CIC	7.20%	4.60%	3.20%	4.00%	2.30%	1.60%	5.50%	7.50%	2.10%	7.40%	11.70%	4.30%	2.50%	5.60%	4.30%	6.70%	6.40%	2.40%	3.10%	7.50%	39.40%	8.90%	9.50%	-0.60%	13.10%	4.80%
72	NP_000076(CLCNKB)	CIC	8.70%	4.10%	2.50%	2.20%	1.60%	2.80%	5.10%	7.90%	2.50%	4.90%	11.80%	3.20%	2.90%	6.60%	5.80%	8.20%	6.00%	2.20%	2.60%	8.60%	40.60%	7.30%	7.30%	0.00%	14.20%	5.30%
73	NP_004357(CLCN2)	CIC	10.20%	6.60%	1.60%	2.90%	1.90%	3.80%	6.20%	7.20%	1.90%	5.20%	11.00%	3.60%	2.60%	5.20%	6.00%	7.50%	5.80%	1.60%	1.80%	7.50%	39.10%	10.20%	9.10%	1.10%	13.30%	5.40%
74	NP_068505(CLCN6)	CIC	4.50%	6.20%	1.90%	2.90%	6.20%	2.90%	7.10%	9.40%	1.60%	3.60%	13.60%	3.90%	1.30%	6.50%	4.50%	6.20%	3.20%	2.30%	2.30%	9.70%	37.90%	10.10%	10.00%	0.10%	9.40%	4.80%
75	NP_068504(CLCN6)	CIC	5.10%	5.90%	2.80%	3.40%	5.10%	2.80%	6.80%	11.30%	0.60%	3.40%	11.90%	4.00%	1.70%	7.90%	4.00%	7.10%	4.20%	1.40%	1.70%	8.80%	37.10%	9.90%	10.20%	-0.30%	11.30%	5.60%
76	NP_068503(CLCN6)	CIC	4.40%	6.90%	1.90%	2.80%	6.20%	3.10%	7.20%	9.40%	1.60%	3.80%	13.40%	4.10%	1.20%	6.20%	4.40%	6.20%	3.10%	2.20%	2.50%	9.40%	37.20%	11.00%	10.00%	1.00%	9.30%	5.00%
77	NP_001277(CLCN6)	CIC	5.10%	5.30%	3.80%	3.60%	2.90%	3.60%	6.00%	7.60%	1.80%	4.70%	11.90%	3.80%	2.90%	6.40%	4.50%	7.70%	5.90%	1.20%	3.10%	8.40%	36.50%	9.10%	9.60%	-0.50%	13.60%	7.40%
78	NP_001278(CLCN7)	CIC	8.20%	6.00%	3.20%	4.10%	1.10%	2.60%	4.70%	8.10%	2.20%	5.80%	11.60%	3.60%	2.60%	5.80%	5.00%	7.30%	4.70%	1.40%	2.60%	9.30%	40.70%	9.60%	8.80%	0.80%	12.00%	5.80%
79	NP_004061(CLCNKA)	CIC	9.00%	3.80%	2.30%	2.20%	1.60%	3.60%	4.70%	7.60%	2.60%	5.50%	12.20%	3.20%	2.50%	6.40%	5.70%	7.60%	6.80%	1.90%	2.60%	8.20%	41.30%	7.00%	6.90%	0.10%	14.40%	5.90%
80	NP_001820(CLCN3)	CIC	8.40%	4.60%	3.30%	4.80%	2.20%	1.70%	5.60%	7.70%	2.00%	7.80%	9.80%	4.30%	2.80%	5.50%	4.30%	6.80%	6.00%	2.30%	3.70%	6.60%	38.10%	8.90%	10.40%	-1.50%	12.80%	5.00%
81	NP_004203(SLC28A2)	CNT	8.40%	4.60%	3.30%	4.80%	2.20%	1.70%	5.60%	7.70%	2.00%	7.80%	9.80%	4.30%	2.80%	5.50%	4.30%	6.80%	6.00%	2.30%	3.70%	6.60%	38.10%	8.90%	10.40%	-1.50%	12.80%	5.00%
82	NP_071410(SLC28A3)	CNT	7.70%	3.90%	4.30%	2.60%	2.00%	3.00%	4.90%	7.40%	2.30%	6.90%	10.60%	3.80%	3.30%	6.80%	3.60%	8.80%	5.50%	2.30%	3.00%	7.10%	39.10%	7.70%	7.50%	0.20%	14.30%	7.30%
83	NP_004204(SLC28A1)	CNT	10.30%	5.40%	2.30%	2.80%	3.10%	3.70%	5.20%	6.60%	1.20%	5.40%	14.30%	2.90%	2.50%	6.50%	3.50%	8.00%	4.20%	2.20%	2.00%	7.90%	44.40%	8.30%	8.00%	0.30%	12.20%	6.00%
84	NP_1775924(SLC9A9)	CPA1	7.40%	2.60%	4.80%	3.60%	1.60%	4.70%	5.10%	6.70%	2.60%	6.50%	12.70%	4.20%	3.10%	8.20%	4.20%	6.00%	6.50%	1.10%	3.70%	4.70%	39.50%	6.80%	8.70%	-1.90%	12.50%	9.50%
85	NP_115980(SLC9A7)	CPA1	8.40%	4.70%	3.40%	4.30%	1.10%	2.60%	5.00%	7.70%	2.60%	5.20%	12.00%	3.00%	2.50%	7.70%	4.10%	8.40%	7.00%	1.40%	2.80%	5.90%	39.20%	7.70%	9.30%	-1.60%	15.40%	6.00%
86	NP_004165(SLC9A3)	CPA1	7.10%	5.90%	3.10%	4.30%	0.60%	2.90%	5.60%	6.80%	2.30%	5.40%	12.40%	4.10%	2.00%	6.00%	4.40%	7.90%	5.40%	1.30%	2.80%	9.70%	40.60%	10.00%	9.90%	0.10%	13.30%	6.00%
87	NP_004585(SLC9A5)	CPA1	8.40%	5.20%	2.10%	4.00%	1.60%	3.70%	6.00%	6.40%	2.70%	4.40%	12.60%	4.80%	1.60%	4.60%	5.20%	8.00%	5.70%	1.70%	2.30%	9.00%	39.00%					

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (101-150).

	Protein	Family	Amino acid																		Combinations of amino acids							
			Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
101	NP_003975(SLC13A2)	DASS	10.10%	1.70%	4.40%	1.50%	1.90%	3.90%	3.50%	6.10%	1.70%	7.30%	15.20%	3.00%	3.20%	6.10%	6.80%	7.30%	5.90%	2.50%	1.50%	6.40%	45.10%	4.70%	5.00%	-0.30%	13.20%	8.30%
102	NP_036582(SLC13A4)	DASS	6.40%	2.10%	4.60%	1.90%	2.40%	3.00%	5.40%	5.80%	2.10%	6.20%	12.90%	5.30%	3.20%	5.10%	5.80%	8.00%	6.50%	2.40%	2.20%	8.60%	39.20%	7.40%	7.30%	0.10%	14.50%	7.60%
103	NP_071889(SLC13A1)	DASS	7.60%	1.80%	3.70%	1.80%	1.80%	1.70%	4.70%	5.90%	1.30%	7.60%	12.60%	5.40%	3.70%	6.60%	5.70%	7.10%	8.10%	2.70%	3.00%	7.20%	41.60%	7.20%	6.50%	0.70%	15.20%	5.40%
104	NP_808218(SLC13A5)	DASS	9.20%	2.60%	3.00%	2.30%	1.90%	2.80%	4.60%	5.80%	0.90%	5.60%	13.60%	5.10%	4.40%	6.90%	5.80%	5.30%	6.50%	2.80%	1.90%	9.00%	44.30%	7.70%	6.90%	0.80%	11.80%	5.80%
105	NP_005651(SLC35A2)	DMT	13.40%	3.50%	2.50%	1.50%	0.80%	4.50%	1.50%	10.40%	1.50%	3.50%	15.70%	3.50%	0.80%	4.80%	5.30%	7.60%	5.30%	1.30%	2.80%	9.80%	47.20%	7.00%	3.00%	4.00%	12.90%	7.00%
106	NP_005818(SLC35B1)	DMT	6.50%	2.80%	2.50%	1.90%	2.20%	3.10%	2.80%	8.10%	1.60%	6.50%	15.20%	5.60%	3.10%	7.10%	3.40%	6.80%	7.10%	1.20%	4.70%	7.80%	43.10%	8.40%	4.70%	3.70%	13.90%	5.60%
107	NP_006407(SLC35A1)	DMT	9.50%	2.70%	2.70%	2.10%	2.10%	3.60%	3.30%	6.50%	0.00%	5.60%	14.20%	5.30%	2.70%	4.50%	2.10%	7.40%	8.00%	1.20%	5.30%	11.30%	45.10%	8.00%	5.40%	2.60%	15.40%	6.30%
108	NP_036375(SLC35A3)	DMT	7.40%	2.20%	3.40%	2.80%	0.90%	4.00%	2.80%	6.80%	0.30%	6.80%	15.40%	5.80%	2.50%	5.80%	2.50%	8.60%	6.50%	1.50%	5.20%	8.90%	44.30%	8.00%	5.60%	2.40%	15.10%	7.40%
109	NP_061126(SLC35E3)	DMT	7.30%	4.80%	3.40%	2.00%	2.80%	4.50%	1.70%	7.60%	1.70%	5.90%	12.70%	2.80%	3.10%	6.80%	4.80%	8.50%	6.50%	2.00%	3.40%	7.60%	40.30%	7.60%	3.70%	3.90%	15.00%	7.90%
110	NP_060347(SLC35F6)	DMT	9.70%	4.00%	2.70%	3.00%	1.30%	4.30%	3.80%	8.90%	2.20%	5.90%	16.40%	2.20%	3.20%	6.20%	3.80%	7.80%	4.90%	1.30%	1.90%	6.50%	44.70%	6.20%	6.80%	-0.60%	12.70%	7.00%
111	NP_060415(SLC35A5)	DMT	5.90%	4.20%	5.00%	3.30%	2.60%	3.30%	5.00%	3.80%	2.10%	7.10%	12.30%	5.20%	1.90%	9.00%	3.10%	9.70%	5.40%	1.70%	3.10%	6.60%	40.90%	9.40%	8.30%	1.10%	15.10%	8.30%
112	NP_055954(SLC35D1)	DMT	9.00%	2.80%	3.90%	3.10%	1.10%	2.50%	3.90%	7.60%	0.60%	6.20%	13.00%	6.20%	3.10%	7.60%	2.30%	5.90%	7.60%	1.10%	4.20%	8.20%	44.00%	9.00%	7.00%	2.00%	13.50%	6.40%
113	NP_116215(SLC35B4)	DMT	6.90%	3.00%	4.50%	1.50%	1.80%	2.40%	3.30%	6.00%	1.80%	9.10%	12.70%	4.50%	3.60%	9.10%	3.60%	6.30%	6.30%	1.80%	3.90%	7.60%	45.40%	7.50%	4.80%	2.70%	12.60%	6.90%
114	NP_542401(SLC35A4)	DMT	11.10%	4.90%	2.80%	0.90%	2.20%	3.70%	1.20%	9.30%	1.90%	2.20%	22.50%	1.20%	3.40%	2.80%	6.50%	7.70%	4.00%	1.50%	3.70%	6.50%	45.10%	6.10%	2.10%	4.00%	11.70%	6.50%
115	NP_060859(SLC35C1)	DMT	8.20%	3.30%	3.60%	2.50%	2.50%	2.20%	3.30%	8.00%	0.80%	3.80%	16.20%	3.80%	2.70%	5.50%	3.80%	8.20%	7.40%	2.20%	3.60%	8.20%	41.90%	7.10%	5.80%	1.30%	15.60%	5.80%
116	NP_079157(SLC35E1)	DMT	5.60%	4.50%	5.60%	3.40%	1.10%	3.80%	1.50%	3.40%	3.00%	6.40%	15.00%	4.10%	3.00%	4.50%	4.10%	9.80%	6.00%	1.90%	4.50%	8.60%	40.10%	8.60%	4.90%	3.70%	15.80%	9.40%
117	NP_057032(SLC35B3)	DMT	6.00%	2.50%	5.00%	2.70%	2.20%	3.70%	2.20%	6.70%	0.50%	8.50%	11.50%	6.20%	3.00%	7.20%	2.50%	7.70%	7.50%	0.70%	4.70%	8.70%	41.90%	8.70%	4.90%	3.80%	15.20%	8.70%
118	NP_694958(SLC35G1)	DMT	9.10%	3.30%	0.80%	3.00%	2.70%	2.70%	3.60%	8.50%	0.50%	7.70%	10.40%	4.70%	2.50%	7.40%	5.50%	7.70%	5.80%	2.20%	3.30%	8.50%	43.10%	8.00%	6.60%	1.40%	13.50%	3.50%
119	NP_079522(SLC35G2)	DMT	5.80%	3.40%	2.90%	3.60%	1.90%	2.70%	4.60%	6.10%	1.50%	8.30%	9.20%	4.90%	4.40%	5.80%	5.10%	7.30%	6.60%	1.90%	4.90%	9.20%	38.30%	8.30%	8.20%	0.10%	13.90%	5.60%
120	NP_775271(SLC35C2)	DMT	7.90%	3.80%	1.60%	2.50%	1.10%	3.30%	4.10%	8.20%	2.20%	4.40%	20.80%	3.30%	2.20%	8.50%	1.90%	8.50%	5.20%	1.90%	2.20%	6.30%	47.90%	7.10%	6.60%	0.50%	13.70%	4.90%
121	NP_775096(SLC35C2)	DMT	7.60%	3.80%	1.70%	2.60%	1.20%	3.50%	4.40%	8.10%	2.30%	4.40%	20.60%	3.20%	2.00%	8.40%	2.00%	9.00%	5.20%	2.00%	2.00%	5.80%	46.80%	7.00%	7.00%	0.00%	14.20%	5.20%
122	NP_001523(SLC29A2)	ENT	8.30%	2.90%	2.90%	2.90%	2.40%	3.70%	3.30%	5.70%	1.10%	4.40%	17.50%	2.40%	2.90%	8.60%	6.40%	9.20%	6.10%	1.30%	2.40%	5.70%	44.50%	5.30%	6.20%	-0.90%	15.30%	6.60%
123	NP_060814(SLC29A3)	ENT	8.00%	4.00%	2.90%	2.90%	2.30%	1.90%	3.20%	6.10%	1.30%	5.10%	14.70%	2.30%	2.30%	6.30%	5.30%	11.20%	6.90%	1.10%	3.80%	8.40%	42.50%	6.30%	6.10%	0.20%	18.10%	4.80%
124	NP_004946(SLC29A1)	ENT	10.10%	3.30%	3.10%	1.80%	2.20%	3.10%	3.90%	5.90%	0.90%	7.50%	13.60%	3.50%	3.10%	8.80%	4.80%	8.60%	5.30%	1.50%	2.60%	6.60%	46.60%	6.80%	5.70%	1.10%	13.90%	6.20%
125	NP_694979(SLC29A4)	ENT	9.10%	6.40%	1.70%	4.00%	2.30%	1.90%	3.20%	8.10%	3.40%	4.70%	13.40%	1.10%	2.80%	5.10%	6.00%	7.20%	6.00%	1.10%	4.20%	8.30%	40.60%	7.50%	7.20%	0.30%	13.20%	3.60%
126	NP_149093(Protein)	GPH	10.70%	6.00%	0.50%	3.30%	3.60%	2.70%	3.80%	9.00%	1.60%	2.70%	17.20%	1.30%	2.20%	5.10%	6.70%	6.90%	4.70%	1.10%	2.90%	8.10%	43.80%	7.30%	7.10%	0.20%	11.60%	3.20%
127	NP_057264(SLC45A2)	GPH	7.20%	4.20%	2.80%	3.40%	2.50%	2.80%	3.60%	9.60%	2.50%	4.70%	12.30%	3.20%	3.40%	6.00%	4.70%	7.20%	5.10%	1.10%	4.90%	8.90%	39.10%	7.40%	7.00%	0.40%	12.30%	5.60%
128	NP_778148(MFSD12)	GPH	11.90%	4.70%	1.90%	2.30%	3.20%	2.30%	2.80%	7.90%	2.80%	3.80%	15.50%	1.50%	2.50%	4.50%	5.90%	7.00%	5.30%	2.10%	4.20%	7.90%	43.60%	6.20%	5.10%	1.10%	12.30%	4.20%
129	NP_004861(MPDU1)	LCT	8.50%	2.00%	2.80%	1.60%	2.00%	5.30%	2.40%	8.10%	1.60%	4.50%	18.60%	4.90%	2.40%	4.90%	4.90%	6.10%	6.10%	1.20%	2.80%	9.30%	45.80%	6.90%	4.00%	2.90%	12.20%	8.10%
130	NP_004928(CTNS)	LCT	3.50%	3.30%	6.00%	2.20%	1.40%	4.40%	2.50%	6.00%	1.10%	8.20%	11.40%	3.30%	1.40%	9.00%	4.60%	7.90%	5.70%	2.70%	4.10%	11.40%	43.50%	6.60%	4.70%	1.90%	13.60%	10.40%
131	NP_001142(SLC25A4)	MC	11.40%	6.40%	2.40%	5.40%	1.30%	4.40%	2.00%	9.80%	1.70%	5.70%	7.70%	7.40%	2.70%	7.10%	2.40%	4.70%	3.00%	2.00%	4.40%	8.10%	40.00%	13.80%	7.40%	6.40%	7.70%	6.80%
132	NP_001143(SLC25A5)	MC	11.40%	6.00%	2.30%	5.70%	1.30%	4.00%	2.00%	10.40%	0.70%	6.70%	7.00%	7.70%	2.70%	6.00%	2.30%	4.00%	5.70%	1.70%	4.70%	7.40%	38.50%	13.70%	7.70%	6.00%	9.70%	6.30%
133	NP_003942(SLC25A14)	MC	6.50%	5.20%	2.20%	3.10%	0.90%	4.60%	3.70%	9.80%	2.20%	9.50%	9.80%	5.20%	3.40%	5.80%	3.10%	5.80%	5.80%	1.80%	3.10%	8.30%	39.90%	10.40%	6.80%	3.60%	11.60%	6.80%
134	NP_073721(SLC25A14)	MC	6.50%	5.30%	2.20%	3.10%	0.90%	4.70%	3.70%	9.60%	2.20%	9.60%	9.90%	5.30%	3.40%	5.90%	3.10%	5.60%	5.90%	1.90%	3.10%	8.10%	40.00%	10.60%	6.80%	3.80%	11.50%	6.90%
135	NP_000378(SLC25A20)	MC	7.60%	4.70%	2.70%	3.00%	2.00%	3.70%	3.70%	11.00%	0.70%	5.30%	10.00%	6.00%	3.70%	7.30%	8.00%	4.30%	6.00%	1.00%	3.30%	6.30%	36.50%	10.70%	6.70%	4.00%	10.30%	6.40%
136	NP_004268(SLC25A27)	MC	9.70%	7.50%	1.50%	1.50%	1.50%	3.70%	10.40%	8.20%	1.50%	5.20%	13.40%	3.70%	3.70%	3.00%	5.20%	6.00%	5.20%	2.20%	1.50%	5.20%	36.50%	11.20%	11.90%	-0.70%	11.20%	5.20%
137	NP_006349(SLC25A17)	MC	7.50%	5.90%	3.60%	2.30%	0.70%	3.60%	3.60%	6.50%	2.60%	5.20%	14.30%	6.20%	2.60%	5.90%												

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (151-200).

			Amino acid																			Combinations of amino acids						
	Protein	Family	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
151	NP_077008(SLC25A23)	MC	7.90%	7.90%	2.30%	5.40%	0.80%	6.40%	6.20%	8.90%	2.70%	5.60%	11.40%	3.70%	2.10%	3.10%	3.50%	7.30%	5.00%	2.50%	2.30%	5.00%	33.00%	11.60%	11.60%	0.00%	12.30%	8.70%
152	NP_085134(SLC25A21)	MC	6.70%	4.30%	3.70%	1.70%	1.00%	4.30%	5.40%	9.70%	0.70%	6.70%	10.00%	6.70%	3.00%	6.00%	5.70%	5.00%	5.00%	1.30%	4.70%	8.40%	37.80%	11.00%	7.10%	3.90%	10.00%	8.00%
153	NP_112581(SLC25A31)	MC	8.90%	6.30%	1.90%	4.10%	1.60%	4.40%	3.50%	10.20%	1.00%	5.40%	8.30%	8.60%	2.20%	7.90%	3.50%	6.30%	3.50%	1.00%	3.80%	7.60%	38.10%	14.90%	7.60%	7.30%	9.80%	6.30%
154	NP_113669(SLC25A18)	MC	11.40%	5.40%	2.90%	3.50%	2.90%	3.80%	3.20%	10.80%	1.90%	6.00%	11.40%	5.10%	4.40%	4.80%	3.20%	5.10%	6.00%	0.60%	2.20%	5.40%	39.00%	10.50%	6.70%	3.80%	11.10%	6.70%
155	NP_114153(SLC25A2)	MC	10.30%	3.00%	1.30%	3.00%	2.70%	4.30%	3.30%	11.00%	1.00%	4.30%	10.60%	7.00%	4.70%	6.30%	3.30%	6.60%	5.00%	0.70%	4.70%	7.00%	38.50%	10.00%	6.30%	3.70%	11.60%	5.60%
156	NP_115691(SLC25A33)	MC	9.00%	5.90%	3.40%	0.30%	2.20%	4.70%	5.60%	8.70%	1.20%	6.20%	10.00%	5.30%	2.20%	5.30%	3.70%	7.50%	7.20%	0.30%	5.00%	6.20%	36.70%	11.20%	5.90%	5.30%	14.70%	8.10%
157	NP_219480(MCART1)	MC	6.40%	5.40%	4.00%	3.00%	2.00%	4.40%	4.00%	7.40%	4.70%	7.40%	12.80%	5.70%	2.00%	7.10%	4.40%	4.40%	6.40%	0.70%	3.00%	4.70%	38.40%	11.10%	7.00%	4.10%	10.80%	8.40%
158	NP_112489(SLC25A28)	MC	11.30%	6.20%	4.50%	1.10%	1.70%	6.80%	4.50%	5.60%	3.40%	4.00%	5.10%	2.80%	3.40%	5.10%	4.00%	5.60%	8.50%	1.70%	6.20%	8.50%	34.00%	9.00%	5.60%	3.40%	14.10%	11.30%
159	NP_036272(SLC25A10)	MC	9.40%	7.00%	2.10%	3.10%	2.80%	4.90%	3.10%	9.80%	2.40%	2.40%	13.20%	4.20%	2.40%	4.90%	3.50%	6.30%	5.90%	0.30%	3.50%	8.70%	38.60%	11.20%	6.20%	5.00%	12.20%	7.00%
160	NP_110407(MFTC)	MC	7.90%	5.40%	3.50%	2.50%	1.30%	3.50%	4.40%	8.90%	2.50%	5.10%	11.40%	5.70%	1.90%	4.40%	3.20%	5.70%	6.00%	1.90%	6.30%	8.30%	37.10%	11.10%	6.90%	4.20%	11.70%	7.00%
161	NP_003696(SLC25A12)	MC	9.60%	5.30%	3.70%	4.30%	1.00%	4.60%	5.30%	8.30%	1.90%	5.80%	10.20%	5.00%	1.50%	6.20%	5.00%	5.80%	5.20%	0.60%	3.70%	7.20%	39.00%	10.30%	9.60%	0.70%	11.00%	8.30%
162	NP_003553(SLC25A11)	MC	10.50%	6.40%	2.50%	3.20%	1.00%	2.90%	3.20%	10.80%	1.00%	4.80%	10.80%	5.40%	3.50%	5.70%	3.80%	5.40%	8.60%	0.60%	3.80%	6.10%	37.90%	11.80%	6.40%	5.40%	14.00%	5.40%
163	NP_005975(SLC25A1)	MC	8.70%	7.10%	3.20%	3.50%	1.90%	3.50%	3.50%	10.90%	2.30%	5.10%	9.60%	6.40%	2.30%	4.20%	5.50%	3.90%	5.80%	1.00%	3.20%	8.40%	36.00%	13.50%	7.00%	6.50%	9.70%	6.70%
164	NP_660348(SLC25A43)	MC	8.50%	5.90%	2.60%	2.30%	2.10%	5.30%	2.60%	8.50%	1.80%	3.80%	14.10%	5.00%	2.10%	5.30%	5.00%	6.50%	6.20%	2.10%	3.20%	7.30%	39.00%	10.90%	4.90%	6.00%	12.70%	7.90%
165	NP_689920(SLC25A16)	MC	11.40%	5.40%	2.10%	2.10%	1.80%	2.70%	2.10%	10.50%	4.20%	4.80%	9.90%	4.80%	4.50%	6.00%	5.10%	3.90%	7.20%	0.30%	4.80%	6.00%	38.10%	10.20%	4.20%	6.00%	11.10%	4.80%
166	NP_775742(SLC25A26)	MC	11.80%	5.90%	1.10%	2.70%	1.10%	4.30%	3.80%	9.10%	2.20%	4.30%	10.80%	3.80%	1.60%	5.40%	3.20%	9.70%	4.80%	2.70%	2.20%	9.70%	42.00%	9.70%	6.50%	3.20%	14.50%	5.40%
167	NP_775908(SLC25A41)	MC	5.60%	6.90%	2.60%	2.20%	2.60%	6.50%	3.90%	10.30%	0.00%	5.20%	12.90%	3.90%	4.30%	2.60%	4.70%	6.00%	7.30%	1.30%	4.70%	6.50%	32.80%	10.80%	6.10%	4.70%	13.30%	9.10%
168	NP_001627(SLC25A6)	MC	10.70%	6.00%	2.00%	5.40%	1.30%	4.40%	2.30%	10.40%	1.00%	6.70%	6.70%	7.40%	2.70%	6.70%	2.30%	4.40%	5.00%	1.70%	4.00%	8.70%	39.50%	13.40%	7.70%	5.70%	9.40%	6.40%
169	NP_660325(SLC25A48)	MC	6.40%	6.40%	1.90%	3.20%	1.90%	4.50%	3.20%	12.10%	2.50%	3.80%	8.90%	1.90%	4.50%	7.00%	5.70%	8.30%	5.10%	0.60%	1.90%	10.20%	36.30%	8.30%	6.40%	1.90%	13.40%	6.40%
170	NP_003347(UCP3)	MC	8.70%	5.80%	2.90%	4.20%	2.60%	4.50%	2.90%	7.70%	1.00%	3.50%	8.70%	4.80%	4.20%	4.80%	5.80%	5.80%	8.00%	0.60%	3.80%	9.90%	35.60%	10.60%	7.10%	3.50%	13.80%	7.40%
171	NP_073714(UCP3)	MC	9.50%	5.50%	2.90%	4.70%	2.90%	4.40%	2.50%	8.40%	1.10%	4.00%	8.00%	4.70%	3.60%	4.00%	5.80%	5.50%	8.40%	0.40%	4.00%	9.80%	35.30%	10.20%	7.20%	3.00%	13.90%	7.30%
172	NP_006753(LAPTM5)	MET	4.60%	3.80%	3.10%	1.90%	3.80%	2.70%	4.60%	2.30%	1.90%	7.60%	15.60%	5.70%	5.70%	5.00%	5.30%	10.70%	4.20%	0.40%	5.00%	6.10%	38.90%	9.50%	6.50%	3.00%	14.90%	5.80%
173	NP_055528(LAPTM4A)	MET	6.40%	3.90%	4.70%	3.40%	4.30%	1.70%	3.90%	2.60%	0.90%	7.30%	11.20%	3.00%	4.30%	6.40%	7.30%	6.90%	3.40%	1.30%	7.70%	9.40%	40.70%	6.90%	7.30%	-0.40%	10.30%	6.40%
174	NP_060877(LAPTM4B)	MET	11.00%	7.90%	4.10%	4.10%	3.50%	2.50%	2.80%	5.40%	0.60%	7.60%	9.50%	1.90%	2.80%	3.80%	7.60%	6.60%	5.70%	1.60%	4.70%	6.30%	38.20%	9.80%	6.90%	2.90%	12.30%	6.60%
175	NP_001458(SLC37A4)	MFS	9.60%	2.80%	2.80%	2.10%	1.60%	2.30%	3.00%	10.00%	0.90%	4.20%	13.30%	3.70%	3.30%	6.50%	4.00%	11.00%	4.70%	3.00%	3.70%	7.50%	41.10%	6.50%	5.10%	1.40%	15.70%	5.10%
176	NP_003044(SLC18A1)	MFS	9.30%	2.50%	3.00%	2.90%	1.70%	2.10%	4.20%	9.00%	1.90%	5.90%	13.00%	2.90%	5.00%	5.90%	6.50%	7.40%	5.30%	1.00%	2.50%	8.20%	42.30%	5.40%	7.10%	-1.70%	12.70%	5.10%
177	NP_003045(SLC18A2)	MFS	9.10%	2.70%	3.30%	3.50%	1.90%	2.90%	3.50%	7.80%	1.40%	9.50%	11.50%	3.10%	5.10%	5.30%	5.40%	8.20%	4.90%	1.00%	3.30%	6.60%	42.00%	5.80%	7.00%	-1.20%	13.10%	6.20%
178	NP_003046(SLC18A3)	MFS	13.90%	5.50%	1.70%	3.80%	1.30%	1.70%	4.50%	7.30%	1.50%	4.30%	13.70%	1.30%	2.40%	4.00%	8.10%	6.60%	4.30%	1.10%	4.10%	8.70%	44.60%	6.80%	8.30%	-1.50%	10.90%	3.40%
179	NP_003048(SLC22A1)	MFS	7.90%	4.20%	3.10%	3.60%	2.90%	3.20%	4.00%	7.90%	1.30%	5.80%	15.00%	3.10%	3.40%	5.20%	5.40%	6.30%	5.20%	2.30%	3.10%	7.00%	40.90%	7.30%	7.60%	-0.30%	11.50%	6.30%
180	NP_694857(SLC22A1)	MFS	8.10%	5.10%	2.80%	4.30%	3.00%	3.60%	3.80%	8.30%	1.80%	5.10%	13.60%	2.80%	3.40%	5.30%	5.30%	7.10%	4.50%	2.60%	3.20%	6.30%	38.40%	7.90%	8.10%	-0.20%	11.60%	6.40%
181	NP_003049(SLC22A2)	MFS	7.00%	5.60%	3.80%	3.10%	2.30%	2.90%	4.50%	7.60%	1.40%	7.60%	12.80%	3.20%	3.40%	5.60%	5.60%	5.40%	5.00%	2.50%	4.00%	6.70%	39.70%	8.80%	7.60%	1.20%	10.40%	6.70%
182	NP_003051(SLC22A5)	MFS	5.90%	5.60%	2.50%	3.90%	1.30%	2.90%	3.80%	7.00%	1.30%	5.90%	13.50%	2.50%	3.90%	7.20%	4.80%	7.70%	5.90%	2.20%	3.60%	8.60%	41.10%	8.10%	7.70%	0.40%	13.60%	5.40%
183	NP_001033(SLC2A4)	MFS	8.60%	4.50%	2.60%	1.20%	0.60%	4.50%	5.10%	10.40%	0.80%	6.70%	15.50%	1.60%	2.40%	5.30%	5.90%	7.10%	5.10%	1.40%	2.80%	8.10%	44.20%	6.10%	6.30%	-0.20%	12.20%	7.10%
184	NP_003030(SLC2A5)	MFS	8.00%	3.40%	3.00%	1.80%	1.60%	4.40%	5.40%	7.80%	0.60%	7.80%	14.20%	3.20%	2.60%	6.20%	5.00%	6.60%	4.60%	1.20%	3.40%	9.40%	45.60%	6.60%	7.20%	-0.60%	11.20%	7.40%
185	NP_000331(SLC2A2)	MFS	8.60%	3.10%	2.70%	2.30%	1.10%	3.20%	4.60%	8.40%	1.30%	8.80%	10.70%	4.20%	3.20%	8.00%	4.00%	8.20%	5.20%	1.30%	3.20%	7.80%	43.90%	7.30%	6.90%	0.40%	13.40%	5.90%
186	NP_004724(SLC33A1)	MFS	6.70%	2.90%	3.30%	4.60%	1.60%	3.30%	3.50%	7.70%	1.10%	4.90%	14.40%	5.10%	1.80%	6.20%	5.30%	7.10%	6.40%	2.40%	4.00%	7.80%	40.00%	8.00%	8.10%	-0.10%	13.50%	6.60%
187	NP_004247(SLC22A13)	MFS	8.00%	4.50%	2.50%	2.90%	2.00%	4.40%	4.00%	7.80%	2.00%	4.90%	15.20%	2.70%	3.10%	6.												

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (201–250).

	Protein	Family	Amino acid																		Combinations of amino acids							
			Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
201	NP_055663(SV2B)	MFS	6.70%	3.50%	3.40%	5.00%	2.20%	3.20%	6.10%	8.30%	2.30%	6.10%	9.20%	4.50%	5.00%	7.60%	2.80%	6.60%	4.80%	2.00%	4.40%	6.00%	35.60%	8.00%	11.10%	-3.10%	11.40%	6.60%
202	NP_055664(SV2A)	MFS	7.50%	5.50%	2.60%	4.90%	1.90%	3.10%	6.70%	10.40%	2.00%	4.30%	9.40%	3.50%	3.10%	7.80%	2.80%	7.70%	4.30%	1.90%	3.50%	7.00%	36.00%	9.00%	11.60%	-2.60%	12.00%	5.70%
203	NP_060164(MFSD6)	MFS	6.30%	3.70%	3.70%	3.70%	1.60%	4.60%	6.60%	6.20%	2.10%	6.20%	9.70%	3.80%	2.40%	4.70%	6.40%	7.70%	7.70%	1.60%	3.40%	7.80%	34.70%	7.50%	10.30%	-2.80%	15.40%	8.30%
204	NP_060261(FLVCR2)	MFS	7.80%	2.50%	4.20%	2.30%	1.30%	2.70%	4.80%	7.40%	2.10%	7.60%	11.60%	3.00%	2.50%	5.30%	5.50%	9.50%	5.30%	1.70%	3.60%	9.30%	41.60%	5.50%	7.10%	-1.60%	14.80%	6.90%
205	NP_060954(SLC22A11)	MFS	9.30%	4.90%	1.80%	2.90%	2.40%	5.10%	3.10%	7.30%	0.90%	5.30%	14.70%	2.70%	3.30%	5.50%	5.30%	8.40%	6.50%	2.40%	1.30%	7.10%	41.90%	7.60%	6.00%	1.60%	14.90%	6.90%
206	NP_064425(SLC2A9)	MFS	8.10%	4.80%	2.80%	2.40%	1.70%	3.00%	4.30%	9.60%	1.30%	7.60%	12.80%	3.70%	1.50%	5.70%	5.90%	6.90%	5.60%	1.50%	3.10%	7.80%	42.00%	8.50%	6.70%	1.80%	12.50%	5.80%
207	NP_064705(SLC17A7)	MFS	7.90%	5.00%	2.10%	2.10%	2.10%	2.70%	5.70%	9.60%	2.50%	6.60%	7.90%	2.90%	2.90%	6.60%	6.40%	7.90%	4.80%	2.00%	3.80%	8.60%	37.60%	7.90%	7.80%	0.10%	12.70%	4.80%
208	NP_065079(SLC17A6)	MFS	7.20%	4.00%	2.90%	2.60%	2.10%	2.60%	6.50%	10.10%	1.90%	8.40%	7.40%	4.80%	2.90%	5.50%	4.10%	7.20%	5.70%	2.20%	4.50%	7.40%	35.90%	8.80%	9.10%	-0.30%	12.90%	5.50%
209	NP_068812(SLC22A3)	MFS	8.30%	6.50%	2.70%	2.50%	3.10%	2.50%	4.30%	8.80%	0.70%	7.00%	12.90%	2.30%	1.60%	6.50%	5.60%	5.60%	5.80%	2.20%	2.90%	8.30%	43.00%	8.80%	6.80%	2.00%	11.40%	5.20%
210	NP_110404(SLC2A10)	MFS	10.00%	4.80%	1.80%	2.60%	1.80%	3.10%	2.60%	11.50%	1.30%	4.10%	17.20%	1.70%	1.50%	5.20%	6.30%	9.40%	5.00%	1.50%	2.20%	6.50%	43.00%	6.50%	5.20%	1.30%	14.40%	4.90%
211	NP_115595(MFSD7)	MFS	12.70%	4.30%	1.80%	2.30%	3.20%	2.90%	3.80%	9.80%	1.40%	4.10%	13.20%	1.40%	2.70%	4.70%	6.80%	8.80%	5.90%	1.80%	1.10%	7.30%	42.00%	5.70%	6.10%	-0.40%	14.70%	4.70%
212	(FLJ14753)	MFS	8.50%	2.10%	3.50%	2.10%	1.40%	5.30%	4.30%	9.60%	0.70%	7.10%	11.70%	3.20%	3.20%	6.40%	5.00%	10.60%	4.30%	2.10%	2.50%	6.40%	40.10%	5.30%	6.40%	-1.10%	14.90%	8.80%
213	(MGC11332)	MFS	9.30%	5.10%	2.10%	2.10%	1.50%	2.10%	4.00%	9.50%	1.90%	4.20%	16.20%	3.20%	2.30%	4.40%	4.00%	9.70%	5.50%	1.30%	2.30%	9.30%	43.40%	8.30%	6.10%	2.20%	15.20%	4.20%
214	NP_116228(DIRC2)	MFS	9.40%	5.40%	2.10%	2.10%	2.50%	1.50%	2.70%	8.60%	1.00%	5.20%	16.50%	0.80%	2.30%	6.70%	6.10%	8.40%	5.20%	3.10%	2.50%	7.70%	45.50%	6.20%	4.80%	1.40%	13.60%	3.60%
215	NP_149040(TSCOT)	MFS	8.20%	3.80%	1.30%	2.90%	1.50%	3.20%	2.10%	9.50%	1.70%	5.90%	14.10%	3.40%	3.40%	5.10%	4.80%	10.50%	4.60%	1.10%	4.20%	8.80%	42.10%	7.20%	5.00%	2.20%	15.10%	4.50%
216	NP_149116(SLC22A16)	MFS	6.60%	4.00%	3.50%	2.30%	2.30%	2.60%	4.50%	7.60%	2.10%	4.70%	12.30%	3.60%	2.80%	6.20%	2.90%	9.20%	6.40%	2.90%	4.50%	9.00%	38.80%	7.60%	6.80%	0.80%	15.60%	6.10%
217	NP_443117(SLC2A13)	MFS	10.30%	4.80%	3.80%	3.30%	2.40%	3.30%	5.20%	9.40%	0.30%	5.20%	10.80%	3.20%	2.10%	5.60%	3.80%	7.60%	6.00%	1.70%	3.70%	7.00%	38.90%	8.00%	8.50%	-0.50%	13.60%	7.10%
218	NP_439896(SLC18B1)	MFS	7.90%	2.20%	2.90%	2.00%	1.50%	1.10%	5.00%	11.20%	0.90%	6.10%	15.40%	3.10%	3.70%	7.70%	5.90%	8.80%	3.30%	1.50%	2.60%	7.20%	44.30%	5.30%	7.00%	-1.70%	12.10%	4.00%
219	NP_542400(SLC46A1)	MFS	11.30%	4.40%	2.00%	2.00%	1.50%	3.50%	3.30%	8.10%	2.20%	3.50%	17.90%	2.40%	2.40%	6.30%	5.00%	7.60%	5.20%	1.50%	3.10%	7.00%	46.00%	6.80%	5.30%	1.50%	12.80%	5.50%
220	NP_061063(SLC16A10)	MFS	7.40%	2.30%	1.60%	2.90%	2.50%	1.90%	4.50%	10.10%	1.00%	6.40%	10.50%	5.40%	4.10%	7.80%	6.60%	8.70%	3.70%	1.20%	2.50%	8.90%	41.00%	7.70%	7.40%	0.30%	12.40%	3.50%
221	NP_003042(SLC16A1)	MFS	7.60%	2.80%	3.20%	2.60%	2.40%	2.40%	4.00%	11.40%	1.20%	6.40%	10.40%	5.80%	2.80%	6.80%	5.60%	7.60%	4.20%	1.20%	3.80%	7.80%	39.00%	8.60%	6.60%	2.00%	11.80%	5.60%
222	NP_612440(MFSD3)	MFS	14.10%	3.60%	0.70%	2.20%	1.50%	3.90%	1.50%	11.70%	1.90%	0.70%	25.20%	1.90%	1.20%	2.70%	6.60%	4.90%	5.30%	2.20%	1.90%	6.30%	49.00%	5.50%	3.70%	1.80%	10.20%	4.60%
223	NP_004781(SLC22A6)	MFS	9.40%	5.30%	3.00%	2.30%	2.30%	5.90%	3.40%	8.30%	1.80%	4.40%	14.00%	2.30%	3.60%	4.60%	5.30%	6.40%	5.70%	1.80%	3.20%	6.90%	39.30%	7.60%	5.70%	1.90%	12.10%	8.90%
224	NP_695008(SLC22A6)	MFS	9.30%	5.30%	3.10%	2.40%	2.40%	5.80%	3.30%	8.40%	1.80%	4.40%	14.40%	2.20%	3.60%	4.70%	5.10%	6.50%	5.60%	1.60%	3.10%	7.10%	39.90%	7.50%	5.70%	1.80%	12.10%	8.90%
225	NP_695009(SLC22A6)	MFS	9.10%	5.50%	3.40%	2.60%	2.60%	6.10%	3.40%	8.10%	2.00%	4.30%	15.00%	2.40%	3.00%	4.90%	4.70%	5.90%	5.50%	1.80%	3.00%	6.70%	40.00%	7.90%	6.00%	1.90%	11.40%	9.50%
226	NP_695010(SLC22A6)	MFS	9.20%	5.60%	3.30%	2.50%	2.50%	6.20%	3.50%	8.10%	1.90%	4.40%	14.60%	2.50%	2.90%	4.80%	5.00%	5.80%	5.60%	1.90%	3.10%	6.60%	39.60%	8.10%	6.00%	2.10%	11.40%	9.50%
227	NP_001111(TETRA)	MFS	11.40%	5.30%	0.40%	2.20%	1.50%	3.30%	2.00%	11.20%	1.10%	3.10%	18.50%	1.80%	2.20%	6.80%	6.40%	8.10%	4.20%	1.80%	2.40%	6.40%	46.20%	7.10%	4.20%	2.90%	12.30%	3.70%
228	NP_002546(SLC22A18)	MFS	11.10%	4.70%	0.70%	2.60%	1.90%	4.20%	1.40%	9.20%	0.90%	3.80%	17.50%	2.10%	3.50%	5.90%	5.70%	8.00%	5.40%	0.50%	1.90%	9.00%	47.30%	6.80%	4.00%	2.80%	13.40%	4.90%
229	NP_647480(SLC17A8)	MFS	7.50%	3.40%	3.90%	2.20%	2.70%	3.10%	6.80%	9.20%	1.90%	7.60%	7.60%	4.40%	3.10%	6.10%	4.40%	7.50%	5.40%	2.00%	3.60%	7.60%	36.40%	7.80%	9.00%	-1.20%	12.90%	7.00%
230	NP_055395(SLC2A8)	MFS	12.80%	4.20%	0.60%	1.90%	1.90%	3.10%	4.00%	9.90%	1.00%	4.00%	13.80%	1.90%	3.10%	6.50%	6.50%	6.90%	3.80%	2.70%	1.70%	9.60%	46.70%	6.10%	5.90%	0.20%	10.70%	3.70%
231	NP_061837(SLC37A1)	MFS	8.30%	3.20%	3.20%	3.60%	2.30%	2.40%	2.60%	10.50%	2.30%	6.80%	13.70%	4.10%	2.10%	5.60%	3.90%	8.40%	5.80%	1.90%	3.60%	5.80%	40.20%	7.30%	6.20%	1.10%	14.20%	5.60%
232	NP_057693(SLC22A17)	MFS	9.80%	6.80%	2.20%	2.50%	2.70%	3.30%	4.10%	9.30%	2.20%	4.60%	20.20%	1.40%	2.20%	4.60%	5.20%	5.70%	4.60%	1.40%	1.60%	5.50%	44.70%	8.20%	6.60%	1.60%	10.30%	5.50%
233	NP_065105(SLC22A17)	MFS	10.60%	5.60%	2.80%	3.30%	3.00%	3.30%	3.30%	10.00%	2.20%	4.50%	16.90%	1.10%	1.70%	5.00%	6.50%	6.10%	4.60%	1.90%	1.70%	5.80%	42.80%	6.70%	6.60%	0.10%	10.70%	6.10%
234	NP_543142(SLC22A9)	MFS	9.40%	5.20%	4.20%	3.80%	2.20%	3.40%	4.00%	5.40%	2.50%	7.10%	13.60%	3.30%	4.30%	6.70%	4.50%	5.60%	5.60%	2.20%	1.60%	5.40%	42.20%	8.50%	7.80%	0.70%	11.20%	7.60%
235	NP_660159(SLC2A12)	MFS	6.20%	3.90%	4.10%	2.10%	1.80%	3.20%	4.20%	8.10%	2.10%	7.60%	13.80%	3.40%	3.20%	3.90%	3.90%	10.90%	5.80%	1.10%	2.60%	8.10%	39.60%	7.30%	6.30%	1.00%	16.70%	7.30%
236	NP_689740(SLC16A14)	MFS	7.30%	3.30%	3.70%	3.30%	2.50%	2.90%	3.70%	10.00%	2.40%	8.20%	11.80%	3.10%	3.50%	6.10%	3.90%	6.30%	4.90%	2.20%	3.90%	6.90%	40.30%	6.40%	7.00%	-0.60%	11.20%	6.60%
237	NP_689812(MFSD6L)	MFS	8.90%	5.50%	1.50%	3.40%	1.90%	2.40%	4.10%	8.20%	2.40%	3.10%	15.50%	3.40%	2.00%	4.40%	4.90%	9.40%										

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (251-300).

			Amino acid																		Combinations of amino acids							
Protein		Family	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
251	NP_006623(SLC17A3)	MFS	5.70%	3.20%	2.70%	2.50%	2.70%	3.20%	2.70%	7.70%	0.70%	8.70%	13.20%	3.50%	2.20%	6.00%	5.50%	11.20%	4.70%	2.50%	3.50%	7.50%	41.10%	6.70%	5.20%	1.50%	15.90%	5.90%
252	NP_653186(SLC22A12)	MFS	11.60%	4.90%	2.20%	2.70%	2.20%	4.20%	2.50%	8.50%	1.40%	3.30%	16.80%	1.30%	3.60%	4.90%	5.60%	6.70%	6.50%	2.90%	1.40%	6.90%	43.50%	6.20%	5.20%	1.00%	13.20%	6.40%
253	NP_700357(SLC22A12)	MFS	10.50%	4.80%	1.80%	2.10%	1.50%	3.60%	2.70%	10.20%	1.50%	3.00%	19.60%	1.50%	3.00%	4.80%	5.10%	5.70%	7.20%	2.70%	1.20%	7.20%	45.10%	6.30%	4.80%	1.50%	12.90%	5.40%
254	NP_115671(SLC37A3)	MFS	7.20%	3.20%	4.70%	2.70%	2.90%	2.50%	5.40%	8.40%	2.30%	5.00%	11.70%	2.50%	1.10%	7.20%	3.20%	11.30%	3.60%	2.90%	3.80%	8.40%	39.50%	5.70%	8.10%	-2.40%	14.90%	7.20%
255	NP_060712(SLC47A1)	MOP	8.60%	3.70%	3.30%	2.30%	2.50%	5.40%	3.70%	8.40%	1.90%	6.50%	16.30%	2.50%	2.10%	4.60%	4.00%	6.10%	4.20%	1.40%	2.60%	9.80%	45.80%	6.20%	6.00%	0.20%	10.30%	8.70%
256	NP_690872(SLC47A2)	MOP	9.10%	3.80%	2.20%	2.30%	2.70%	4.50%	3.00%	8.30%	2.50%	5.30%	14.00%	2.70%	2.30%	4.80%	3.70%	8.10%	5.60%	1.80%	2.70%	10.60%	43.80%	6.50%	5.30%	1.20%	13.70%	6.70%
257	NP_112233(SFXN3)	MTC	8.90%	5.80%	4.30%	3.10%	1.80%	5.50%	4.00%	6.50%	1.50%	6.20%	9.50%	3.70%	3.10%	4.30%	6.80%	5.20%	6.50%	1.50%	2.80%	8.90%	37.80%	9.50%	7.10%	2.40%	11.70%	9.80%
258	NP_653180(SFXN5)	MTC	11.50%	5.30%	4.10%	2.60%	0.90%	5.30%	4.10%	4.70%	1.50%	5.60%	12.60%	3.50%	2.40%	4.70%	7.10%	7.40%	6.20%	0.90%	2.10%	7.60%	42.00%	8.80%	6.70%	2.10%	13.60%	9.40%
259	NP_073591(SFXN1)	MTC	9.90%	5.30%	6.20%	2.20%	1.60%	4.00%	5.00%	5.90%	1.60%	6.50%	8.70%	4.00%	4.00%	5.00%	6.80%	5.30%	7.10%	1.60%	2.20%	7.10%	37.20%	9.30%	7.20%	2.10%	12.40%	10.20%
260	NP_005107(SLC23A2)	NCS2	7.70%	3.10%	3.10%	3.70%	2.20%	2.80%	3.40%	9.80%	0.90%	8.00%	11.40%	4.30%	2.50%	6.00%	5.40%	7.70%	7.20%	1.70%	3.20%	6.00%	39.10%	7.40%	7.10%	0.30%	14.90%	5.90%
261	NP_653313(SLC23A3)	NCS2	6.30%	3.90%	1.60%	1.60%	3.70%	5.70%	3.70%	9.80%	3.30%	2.40%	17.70%	0.80%	2.20%	4.30%	10.40%	11.20%	3.70%	1.60%	0.60%	5.70%	36.40%	4.70%	5.30%	-0.60%	14.90%	7.30%
262	NP_005838(SLC23A1)	NCS2	7.50%	3.50%	2.70%	3.20%	2.50%	3.00%	3.70%	9.00%	1.50%	9.20%	12.00%	2.70%	2.80%	5.20%	6.70%	6.40%	7.50%	1.70%	2.70%	6.50%	40.40%	6.20%	6.90%	-0.70%	13.90%	5.70%
263	NP_689898(SLC23A1)	NCS2	7.50%	3.50%	2.70%	3.20%	2.50%	3.00%	3.70%	9.10%	1.70%	9.10%	12.10%	2.70%	2.80%	5.10%	6.60%	6.30%	7.50%	1.70%	2.70%	6.60%	40.40%	6.20%	6.90%	-0.70%	13.80%	5.70%
264	NP_000569(SLC11A1)	Nramp	9.80%	4.20%	2.90%	2.90%	1.80%	2.90%	3.30%	8.50%	2.00%	6.20%	15.30%	2.40%	2.40%	6.00%	5.30%	6.50%	5.80%	1.50%	3.60%	6.70%	44.00%	6.60%	6.20%	0.40%	12.30%	5.80%
265	NP_000608(SLC11A2)	Nramp	7.70%	3.20%	3.60%	2.90%	1.80%	3.40%	4.50%	8.60%	1.60%	7.00%	11.90%	3.20%	2.70%	6.60%	3.70%	7.80%	4.50%	1.40%	3.70%	10.30%	43.50%	6.40%	7.40%	-1.00%	12.30%	7.00%
266	NP_003033(SLC6A1)	NSS	7.00%	3.00%	3.80%	3.20%	2.30%	3.20%	2.80%	8.30%	0.50%	8.00%	9.80%	3.80%	3.50%	7.30%	4.50%	7.50%	5.20%	3.30%	5.00%	7.70%	39.80%	6.80%	6.00%	0.80%	12.70%	7.00%
267	NP_001035(SLC6A3)	NSS	7.70%	3.20%	2.90%	3.70%	2.10%	2.40%	3.40%	8.20%	1.90%	6.50%	11.60%	3.40%	2.10%	7.10%	4.70%	7.70%	5.30%	2.70%	3.90%	9.40%	42.30%	6.60%	7.10%	-0.50%	13.00%	5.30%
268	NP_001036(SLC6A4)	NSS	7.30%	3.00%	3.50%	2.90%	2.90%	2.90%	4.30%	7.90%	1.10%	8.90%	9.70%	3.30%	1.90%	6.80%	4.80%	6.50%	7.30%	3.00%	4.90%	7.10%	39.80%	6.30%	7.20%	-0.90%	13.80%	6.40%
269	NP_003034(SLC6A6)	NSS	5.20%	3.20%	2.60%	3.10%	3.20%	2.10%	4.20%	8.60%	1.00%	6.90%	11.10%	4.40%	3.10%	6.90%	5.70%	6.90%	5.30%	3.10%	5.30%	8.10%	38.20%	7.60%	7.30%	0.30%	12.20%	4.70%
270	NP_001034(SLC6A2)	NSS	7.80%	3.10%	3.90%	3.60%	1.60%	2.80%	3.20%	8.10%	2.10%	6.50%	12.60%	3.70%	2.10%	7.60%	4.10%	5.50%	5.30%	3.10%	4.90%	8.40%	42.90%	6.80%	6.80%	0.00%	10.80%	6.70%
271	NP_004202(SLC6A5)	NSS	9.00%	3.00%	3.60%	2.90%	2.90%	3.30%	3.90%	7.80%	0.90%	7.20%	9.30%	4.00%	2.90%	6.10%	7.00%	7.20%	5.90%	2.50%	3.60%	7.00%	38.60%	7.00%	6.80%	0.20%	13.10%	6.90%
272	NP_005620(SLC6A8)	NSS	8.00%	3.00%	3.00%	3.50%	3.50%	2.00%	3.30%	9.40%	1.10%	5.40%	11.50%	3.10%	3.00%	6.60%	5.20%	5.40%	4.70%	3.80%	5.00%	9.40%	40.90%	6.10%	6.80%	-0.70%	10.10%	5.00%
273	NP_009162(SLC6A14)	NSS	7.70%	2.60%	4.00%	2.60%	3.10%	3.30%	3.90%	7.80%	1.40%	9.80%	10.30%	5.10%	2.50%	6.20%	4.00%	7.60%	3.60%	3.90%	4.00%	7.00%	40.30%	7.70%	6.50%	1.20%	11.20%	7.30%
274	NP_055044(SLC6A11)	NSS	7.60%	3.20%	3.80%	2.40%	4.30%	1.60%	5.20%	8.70%	1.40%	7.80%	10.40%	4.10%	3.20%	6.00%	4.60%	5.50%	5.50%	3.00%	5.10%	6.60%	38.40%	7.30%	7.60%	-0.30%	11.00%	5.40%
275	NP_055043(SLC6A7)	NSS	7.10%	3.30%	2.20%	3.00%	2.20%	2.80%	3.90%	9.00%	1.60%	5.30%	15.10%	3.00%	3.90%	6.30%	5.00%	6.40%	5.00%	2.70%	4.90%	7.20%	41.00%	6.30%	6.90%	-0.60%	11.40%	5.00%
276	NP_054756(SLC6A16)	NSS	6.20%	3.00%	2.70%	1.90%	2.40%	3.50%	3.90%	6.10%	1.20%	6.80%	12.10%	4.10%	3.50%	7.10%	6.10%	9.80%	5.80%	2.80%	3.00%	7.90%	40.10%	7.10%	5.80%	1.30%	15.60%	6.20%
277	NP_064593(SLC6A20)	NSS	8.40%	2.40%	4.20%	2.40%	2.40%	3.20%	3.90%	7.10%	0.80%	6.40%	13.00%	3.50%	3.00%	5.70%	3.70%	8.30%	5.40%	2.70%	5.90%	7.40%	40.90%	5.90%	6.30%	-0.40%	13.70%	7.40%
278	NP_071800(SLC6A20)	NSS	8.60%	2.30%	4.30%	2.50%	2.30%	3.40%	4.10%	7.00%	0.70%	6.30%	12.80%	3.60%	2.90%	5.80%	3.60%	8.60%	5.00%	2.90%	5.60%	7.40%	40.90%	5.90%	6.60%	-0.70%	13.60%	7.70%
279	NP_003035(SLC6A12)	NSS	5.20%	3.40%	2.80%	3.10%	3.60%	3.10%	4.40%	8.10%	1.10%	6.70%	11.90%	3.60%	2.30%	8.30%	5.40%	6.70%	5.00%	2.90%	4.70%	7.70%	39.80%	7.00%	7.50%	-0.50%	11.70%	5.90%
280	NP_057699(SLC6A13)	NSS	6.60%	3.80%	3.20%	2.30%	3.80%	2.50%	4.70%	8.10%	1.20%	5.80%	12.30%	3.30%	2.80%	7.00%	5.10%	5.80%	5.50%	3.30%	5.30%	7.50%	39.20%	7.10%	7.00%	0.10%	11.30%	5.70%
281	NP_060527(SLC6A15)	NSS	4.80%	2.40%	4.20%	4.50%	2.80%	4.20%	6.20%	7.60%	0.70%	7.30%	10.70%	4.50%	2.10%	5.20%	4.20%	10.00%	3.80%	2.80%	4.20%	8.00%	36.00%	6.90%	10.70%	-3.80%	13.80%	8.40%
282	NP_008865(SLC6A9)	NSS	7.40%	3.60%	4.10%	3.10%	2.70%	3.30%	2.50%	8.50%	1.90%	6.90%	11.40%	2.20%	3.00%	6.70%	5.50%	7.10%	4.50%	2.50%	5.30%	7.80%	40.20%	5.80%	5.60%	0.20%	11.60%	7.40%
283	NP_005621(SLC02A1)	OAT	8.10%	4.40%	3.60%	2.30%	3.70%	3.40%	2.30%	7.50%	1.60%	7.20%	13.10%	3.40%	2.50%	6.20%	5.60%	10.70%	4.40%	1.20%	3.30%	5.60%	40.20%	7.80%	4.60%	3.20%	15.10%	7.00%
284	NP_009187(SLC02B1)	OAT	7.10%	4.10%	2.70%	3.20%	3.40%	3.90%	3.20%	8.20%	2.30%	5.20%	12.10%	3.90%	2.70%	5.60%	6.90%	9.30%	4.90%	0.80%	2.10%	8.20%	38.20%	8.00%	6.40%	1.60%	14.20%	6.60%
285	NP_037404(SLC03A1)	OAT	8.20%	3.70%	3.80%	3.50%	4.60%	3.00%	4.10%	9.40%	1.30%	5.50%	12.40%	3.50%	2.30%	5.50%	5.40%	7.60%	5.80%	1.00%	3.40%	6.20%	37.80%	7.20%	7.60%	-0.40%	13.40%	6.80%
286	NP_059131(SLC01C1)	OAT	5.10%	3.50%	3.70%	2.90%	3.70%	3.50%	4.10%	8.10%	1.00%	8.00%	10.40%	5.80%	1.80%	5.80%	4.50%	10.80%	5.10%	1.10%	4.90%	6.30%	35.60%	9.30%	7.00%	2.30%	15.90%	7.20%
287	NP_062818(SLC01B3)	OAT	5.40%	2.70%	5.60%	3.10%	2.70%	3.00%	3.40%	8.30%	1.90%	8.10%	10.50%	6.30%	2.70%	7.00%	3.30%	10.10%										

Supplementary Table S2 continued. Amino acid composition of human secondary transport proteins (301-336).

		Amino acid																			Combinations of amino acids							
	Protein	Family	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
301	NP_006415(SLC34A2)	PNaS	6.70%	3.00%	3.90%	3.50%	4.10%	3.50%	3.50%	6.10%	0.90%	8.30%	12.00%	5.50%	1.90%	5.50%	5.40%	7.20%	7.50%	2.00%	1.60%	8.00%	40.50%	8.50%	7.00%	1.50%	14.70%	7.40%
302	NP_005064(SLC15A1)	POT	7.50%	2.50%	5.20%	3.10%	1.60%	4.90%	3.80%	6.60%	1.40%	8.30%	8.50%	5.50%	3.70%	7.10%	4.50%	7.20%	5.60%	1.30%	3.70%	7.90%	39.30%	8.00%	6.90%	1.10%	12.80%	10.10%
303	NP_057666(SLC15A3)	POT	10.80%	6.20%	3.30%	2.20%	2.10%	4.50%	2.90%	7.70%	1.40%	4.80%	14.50%	1.20%	2.60%	5.50%	7.20%	7.90%	2.60%	2.10%	3.30%	7.20%	42.80%	7.40%	5.10%	2.30%	10.50%	7.80%
304	NP_066568(SLC15A2)	POT	6.70%	2.90%	4.70%	3.30%	1.60%	4.00%	4.50%	6.00%	2.20%	7.30%	11.20%	5.60%	2.90%	6.00%	5.10%	7.40%	4.80%	1.60%	4.00%	8.10%	39.30%	8.50%	7.80%	0.70%	12.20%	8.70%
305	NP_663623(SLC15A4)	POT	12.70%	4.70%	2.80%	2.60%	2.30%	3.30%	2.90%	9.40%	1.60%	5.90%	13.00%	3.30%	2.10%	6.60%	4.30%	7.30%	4.90%	1.60%	2.90%	6.10%	44.30%	8.00%	5.50%	2.50%	12.20%	6.10%
306	NP_064546(C2orf83)	RFC	7.10%	2.10%	4.30%	4.30%	2.10%	5.70%	5.00%	6.40%	2.90%	4.30%	10.70%	5.70%	3.60%	2.90%	11.40%	7.90%	7.10%	0.70%	0.70%	5.00%	30.00%	7.80%	9.30%	-1.50%	15.00%	10.00%
307	NP_079519(SLC19A3)	RFC	7.50%	2.00%	4.00%	2.20%	1.20%	3.60%	4.40%	4.80%	1.00%	6.70%	10.70%	4.00%	2.80%	6.50%	4.40%	10.30%	5.00%	2.00%	6.50%	10.30%	41.70%	6.00%	6.60%	-0.60%	15.30%	7.60%
308	NP_008927(SLC19A2)	RFC	9.10%	3.40%	2.60%	2.20%	2.00%	3.00%	4.00%	5.40%	0.60%	5.80%	13.10%	2.60%	2.40%	5.60%	4.80%	7.80%	6.40%	2.80%	5.60%	10.50%	44.10%	6.00%	6.20%	-0.20%	14.20%	5.60%
309	NP_000334(SLC5A1)	SSS	7.50%	3.50%	2.60%	2.60%	2.30%	2.00%	4.80%	8.10%	1.40%	10.10%	11.00%	4.20%	4.10%	5.60%	4.10%	6.50%	6.60%	2.10%	3.80%	7.40%	41.60%	7.70%	7.40%	0.30%	13.10%	4.60%
310	NP_003032(SLC5A2)	SSS	9.80%	4.90%	2.10%	2.70%	2.80%	2.80%	3.60%	9.50%	1.50%	4.90%	13.40%	1.50%	3.60%	5.20%	5.40%	7.30%	4.00%	2.20%	3.60%	9.20%	42.50%	6.40%	6.30%	0.10%	11.30%	4.90%
311	NP_000444(SLC5A5)	SSS	9.80%	4.50%	2.30%	3.40%	2.20%	3.10%	3.00%	10.10%	0.30%	3.70%	15.40%	2.00%	3.00%	4.20%	5.30%	7.50%	6.40%	1.90%	3.40%	8.60%	41.70%	6.50%	6.40%	0.10%	13.90%	5.40%
312	NP_008864(SLC5A3)	SSS	8.10%	4.00%	3.50%	3.30%	2.20%	2.50%	5.00%	7.40%	1.00%	8.50%	11.40%	4.50%	4.30%	5.20%	3.90%	7.00%	4.70%	1.90%	3.60%	7.90%	41.10%	8.50%	8.30%	0.20%	11.70%	6.00%
313	NP_066918(SLC5A6)	SSS	7.60%	3.60%	1.60%	2.20%	2.50%	3.60%	2.00%	9.60%	1.40%	4.70%	14.30%	1.70%	3.90%	6.30%	5.20%	9.10%	6.10%	1.40%	4.10%	8.80%	41.70%	5.30%	4.20%	1.10%	15.20%	5.20%
314	NP_068587(SLC5A7)	SSS	9.80%	2.10%	2.40%	4.00%	0.90%	2.90%	3.30%	8.40%	0.90%	7.80%	11.70%	3.30%	3.10%	5.90%	4.10%	8.30%	5.70%	2.10%	5.30%	8.10%	43.30%	5.40%	7.30%	-1.90%	14.00%	5.30%
315	NP_055042(SLC5A4)	SSS	7.60%	3.00%	2.40%	3.30%	2.70%	1.80%	4.60%	7.60%	1.40%	8.50%	11.70%	3.80%	4.40%	4.70%	4.20%	7.40%	6.50%	1.80%	4.10%	8.30%	40.80%	6.80%	7.90%	-1.10%	13.90%	4.20%
316	NP_443176(SLC5A11)	SSS	8.10%	2.80%	1.90%	3.30%	1.80%	3.70%	3.90%	7.10%	1.30%	7.30%	13.00%	3.90%	3.60%	5.20%	5.80%	8.40%	4.90%	2.20%	3.30%	8.60%	42.20%	6.70%	7.20%	0.50%	13.30%	5.60%
317	NP_666018(SLC5A8)	SSS	7.50%	3.00%	3.60%	3.40%	1.80%	3.60%	2.00%	9.20%	1.00%	7.00%	11.50%	2.80%	2.60%	6.20%	3.90%	7.70%	7.40%	1.80%	4.90%	9.00%	41.20%	5.80%	5.40%	0.40%	15.10%	7.20%
318	NP_689564(SLC5A10)	SSS	10.10%	4.60%	2.10%	2.70%	1.80%	3.20%	3.20%	8.50%	1.80%	6.40%	13.30%	1.20%	3.40%	4.60%	6.00%	7.40%	6.00%	2.80%	3.40%	7.80%	42.20%	5.80%	5.90%	-0.10%	13.40%	5.30%
319	NP_000432(SLC26A4)	SuIP	7.60%	3.80%	3.60%	4.40%	1.50%	4.00%	5.10%	6.40%	0.80%	9.20%	11.20%	5.10%	1.50%	5.10%	4.10%	7.30%	5.60%	0.80%	3.10%	9.70%	42.80%	8.90%	9.50%	-0.60%	12.90%	7.60%
320	NP_000102(SLC26A3)	SuIP	6.90%	3.90%	4.10%	5.20%	1.30%	3.10%	3.40%	6.50%	1.40%	9.30%	10.90%	6.00%	1.40%	6.90%	4.60%	7.10%	5.00%	0.70%	2.90%	9.30%	43.30%	9.90%	8.60%	1.30%	12.10%	7.20%
321	NP_000103(SLC26A2)	SuIP	6.40%	2.70%	3.90%	3.10%	2.40%	3.50%	5.00%	6.10%	2.40%	7.60%	12.00%	6.80%	2.00%	5.00%	3.80%	9.10%	5.70%	0.80%	3.20%	8.40%	39.40%	9.50%	8.10%	1.40%	14.80%	7.40%
322	NP_075062(SLC26A6)	SuIP	8.10%	4.30%	2.60%	4.30%	1.10%	4.70%	3.80%	6.60%	2.60%	4.50%	14.10%	4.60%	2.30%	4.60%	4.50%	8.40%	4.20%	1.10%	2.60%	11.00%	42.30%	8.90%	8.10%	0.80%	12.60%	7.30%
323	NP_599025(SLC26A6)	SuIP	8.10%	4.30%	2.60%	4.30%	1.10%	4.60%	3.80%	6.60%	2.60%	4.50%	14.10%	4.60%	2.30%	4.60%	4.50%	8.40%	4.20%	1.10%	2.60%	11.00%	42.30%	8.90%	8.10%	0.80%	12.60%	7.20%
324	NP_602298(SLC26A6)	SuIP	8.30%	4.30%	2.10%	4.20%	1.10%	5.00%	3.60%	6.80%	2.60%	4.50%	14.70%	4.50%	1.90%	4.70%	4.70%	8.10%	4.20%	1.10%	2.60%	10.80%	43.00%	8.80%	7.80%	1.00%	12.30%	7.10%
325	NP_439897(SLC26A7)	SuIP	8.10%	2.10%	4.70%	3.00%	2.70%	3.70%	4.00%	5.80%	2.00%	7.80%	10.70%	5.50%	3.80%	5.20%	3.70%	8.20%	5.00%	1.10%	3.50%	9.50%	41.30%	7.60%	7.00%	0.60%	13.20%	8.40%
326	NP_599028(SLC26A7)	SuIP	8.10%	2.10%	4.70%	3.20%	2.70%	3.60%	3.80%	5.70%	1.80%	7.70%	11.00%	5.40%	3.90%	5.30%	4.10%	7.80%	5.10%	1.10%	3.60%	9.20%	41.30%	7.50%	7.00%	0.50%	12.90%	8.30%
327	NP_443166(SLC26A9)	SuIP	8.10%	2.90%	3.70%	4.00%	1.60%	4.40%	3.40%	6.70%	1.80%	6.70%	10.10%	5.30%	3.20%	6.30%	5.40%	8.20%	4.90%	0.60%	3.90%	8.60%	39.80%	8.20%	7.40%	0.80%	13.10%	8.10%
328	NP_599152(SLC26A9)	SuIP	8.30%	3.00%	3.40%	4.10%	1.70%	4.60%	3.40%	6.80%	1.90%	6.00%	10.50%	5.40%	2.90%	5.90%	5.60%	8.90%	4.80%	0.60%	3.90%	8.20%	38.90%	8.40%	7.50%	0.90%	13.70%	8.00%
329	NP_443193(SLC26A8)	SuIP	5.30%	4.30%	4.80%	3.50%	2.10%	4.50%	5.90%	4.60%	2.10%	8.10%	10.70%	3.60%	3.00%	6.00%	4.60%	11.10%	5.10%	0.80%	3.20%	6.60%	36.70%	7.90%	9.40%	-1.50%	16.20%	9.30%
330	NP_619732(SLC26A8)	SuIP	4.70%	4.60%	5.00%	3.80%	2.10%	4.90%	6.20%	4.60%	2.10%	7.50%	10.40%	3.80%	2.90%	5.50%	4.60%	11.60%	5.20%	0.90%	3.00%	6.50%	34.60%	8.40%	10.00%	-1.60%	16.80%	9.90%
331	NP_597996(SLC26A10)	SuIP	8.90%	5.40%	1.00%	5.40%	5.00%	4.00%	4.50%	13.40%	2.50%	1.50%	12.90%	1.50%	1.00%	4.00%	6.90%	5.90%	4.00%	1.50%	2.50%	8.40%	35.70%	6.90%	9.90%	-3.00%	9.90%	5.00%
332	NP_071325(SLC26A1)	SuIP	11.60%	7.30%	1.00%	4.10%	2.70%	4.00%	3.60%	8.70%	1.90%	2.70%	15.70%	1.30%	2.30%	3.60%	5.30%	7.00%	5.00%	0.90%	2.30%	9.30%	42.90%	8.60%	7.70%	0.90%	12.00%	5.00%
333	NP_602297(SLC26A1)	SuIP	7.10%	8.50%	1.80%	4.00%	3.60%	7.60%	4.50%	7.60%	0.90%	3.60%	14.30%	0.40%	3.10%	2.70%	5.80%	8.90%	4.00%	1.80%	3.60%	6.20%	33.90%	8.90%	8.50%	0.40%	12.90%	9.40%
334	NP_775897(SLC26A11)	SuIP	10.40%	4.10%	1.70%	2.50%	2.00%	3.90%	3.90%	7.30%	1.20%	4.20%	16.30%	2.50%	2.50%	5.40%	6.30%	6.50%	5.40%	0.80%	3.40%	9.50%	45.80%	6.60%	6.40%	0.20%	11.90%	5.60%
335	NP_055394(SLC39A2)	ZIP	12.30%	3.60%	0.60%	1.60%	2.60%	3.20%	5.80%	11.30%	3.60%	3.90%	16.50%	1.90%	2.60%	6.50%	3.60%	7.40%	3.20%	1.60%	1.00%	7.10%	46.30%	5.50%	7.40%	-1.90%	10.60%	3.80%
336	NP_055252(SLC39A1)	ZIP	12.00%	3.70%	0.60%	1.50%	2.50%	4.60%	5.90%	9.00%	2.50%	4.00%	21.00%	1.50%	1.90%	4.00%	6.20%	6.20%	3.40%	0.90%	0.90%	7.70%	48.70%	5.20%	7.40%	-2.20%	9.60%	5.20%

	Amino acid																				Combinations of amino acids					
	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydrophob.	Pos	Neg	Pos - Neg	OH	NH
Average	8.20%	4.17%	3.01%	3.08%	2.13%	3.35%	4.35%	8.02%	1.75%	6.21%	12.60%	3.84%	2.85%	5.75%	5.06%	7.49%	5.54%	1.63%	3.18%	7.76%	40.53%	8.00%	7.44%	0.57%	13.03%	6.36%
STDEV	1.94%	1.35%	1.09%	1.01%	0.90%	1.05%	1.55%	1.69%	0.88%	1.92%	2.64%	1.48%	0.80%	1.29%	1.41%	1.46%	1.16%	0.71%	1.10%	1.35%	3.37%	1.80%	2.03%	2.18%	1.69%	1.44%

Supplementary Table S3. Statistical test for upper outliers of amino acid content in human secondary transport proteins.*

	Amino acid																				Combinations of amino acids			
	Ala	Arg	Asn	Asp	Cys	Gln	Glu	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	Hydroph.	Hydroxyl	Positive	Negative
Amino acid contents ordered from smallest to largest ↓	11.40%	6.40%	4.70%	4.80%	3.70%	5.10%	6.60%	10.50%	3.10%	9.10%	16.80%	6.00%	4.30%	7.60%	7.20%	9.90%	7.50%	2.80%	4.90%	9.80%	45.50%	15.50%	11.00%	10.60%
	11.40%	6.40%	4.80%	4.90%	3.70%	5.10%	6.70%	10.50%	3.10%	9.10%	16.80%	6.00%	4.30%	7.70%	7.30%	9.90%	7.50%	2.80%	4.90%	9.80%	45.60%	15.60%	11.10%	10.70%
	11.40%	6.40%	4.80%	5.00%	3.80%	5.20%	6.80%	10.60%	3.10%	9.20%	16.90%	6.10%	4.30%	7.70%	7.30%	9.90%	7.50%	2.90%	4.90%	9.80%	45.60%	15.60%	11.10%	11.10%
	11.50%	6.50%	4.80%	5.00%	3.80%	5.30%	6.80%	10.80%	3.20%	9.20%	17.20%	6.20%	4.30%	7.80%	7.30%	10.00%	7.50%	2.90%	4.90%	9.90%	45.80%	15.60%	11.10%	11.20%
	11.60%	6.50%	4.80%	5.00%	3.80%	5.30%	6.80%	10.80%	3.20%	9.20%	17.20%	6.20%	4.30%	7.80%	7.30%	10.10%	7.50%	2.90%	5.00%	9.90%	45.80%	15.70%	11.20%	11.20%
	11.60%	6.50%	4.80%	5.00%	4.00%	5.30%	6.90%	10.80%	3.20%	9.30%	17.40%	6.20%	4.40%	7.90%	7.40%	10.30%	7.60%	2.90%	5.00%	10.10%	45.80%	15.80%	11.20%	11.20%
	11.70%	6.60%	4.80%	5.10%	4.00%	5.30%	7.10%	10.90%	3.30%	9.30%	17.50%	6.30%	4.40%	7.90%	7.50%	10.50%	7.70%	2.90%	5.00%	10.20%	46.00%	15.80%	11.20%	11.40%
	11.80%	6.60%	4.90%	5.20%	4.10%	5.30%	7.10%	11.00%	3.40%	9.30%	17.50%	6.30%	4.40%	7.90%	7.60%	10.60%	7.70%	2.90%	5.00%	10.30%	46.20%	15.90%	11.20%	11.40%
	11.90%	6.70%	4.90%	5.20%	4.10%	5.40%	7.20%	11.00%	3.40%	9.50%	17.60%	6.30%	4.40%	8.00%	7.70%	10.60%	7.80%	2.90%	5.10%	10.30%	46.30%	15.90%	11.30%	11.60%
	12.00%	6.70%	5.00%	5.30%	4.10%	5.50%	7.20%	11.20%	3.40%	9.50%	17.70%	6.40%	4.40%	8.10%	7.80%	10.70%	7.90%	3.00%	5.20%	10.40%	46.60%	16.10%	11.30%	11.60%
	12.30%	6.70%	5.00%	5.40%	4.20%	5.60%	7.30%	11.20%	3.60%	9.50%	17.90%	6.70%	4.40%	8.20%	8.00%	10.70%	8.00%	3.00%	5.30%	10.50%	46.60%	16.20%	11.50%	11.60%
	12.40%	6.80%	5.00%	5.40%	4.20%	5.70%	7.40%	11.30%	3.70%	9.60%	17.90%	6.80%	4.50%	8.30%	8.10%	10.80%	8.00%	3.00%	5.30%	10.50%	46.70%	16.20%	11.60%	11.90%
	12.60%	6.90%	5.00%	5.40%	4.30%	5.70%	7.60%	11.30%	3.80%	9.60%	18.00%	6.80%	4.50%	8.40%	8.20%	10.90%	8.00%	3.00%	5.30%	10.50%	46.80%	16.20%	11.80%	12.40%
	12.70%	6.90%	5.20%	5.40%	4.30%	5.80%	7.70%	11.40%	3.80%	9.70%	18.50%	6.90%	4.70%	8.40%	8.50%	11.00%	8.10%	3.00%	5.30%	10.60%	46.80%	16.20%	11.90%	12.60%
	12.70%	7.00%	5.30%	5.40%	4.30%	5.90%	7.80%	11.50%	4.20%	9.80%	18.60%	7.00%	4.80%	8.50%	8.60%	11.00%	8.10%	3.10%	5.30%	10.80%	46.90%	16.40%	11.90%	12.60%
	12.80%	7.10%	5.60%	5.40%	4.30%	6.10%	8.20%	11.60%	4.20%	9.80%	19.60%	7.20%	4.80%	8.60%	9.00%	11.10%	8.40%	3.10%	5.60%	10.80%	47.20%	16.70%	12.10%	12.60%
	12.80%	7.10%	5.60%	5.40%	4.60%	6.20%	8.50%	11.70%	4.20%	9.90%	20.20%	7.40%	4.90%	8.60%	9.10%	11.20%	8.40%	3.10%	5.60%	11.00%	47.30%	16.80%	12.30%	13.00%
	13.40%	7.30%	5.60%	5.40%	4.90%	6.40%	8.90%	11.70%	4.40%	10.00%	20.60%	7.40%	5.00%	8.80%	9.20%	11.20%	8.40%	3.10%	5.90%	11.00%	47.40%	17.70%	13.40%	13.20%
	13.80%	7.50%	5.70%	5.40%	5.00%	6.50%	10.40%	12.10%	4.60%	10.10%	20.80%	7.40%	5.00%	9.00%	9.30%	11.20%	8.50%	3.30%	6.20%	11.10%	47.90%	17.70%	13.50%	13.20%
	13.90%	7.90%	5.90%	5.70%	5.10%	6.80%	10.70%	12.10%	4.70%	10.10%	21.00%	7.70%	5.10%	9.00%	9.40%	11.30%	8.60%	3.30%	6.30%	11.10%	48.40%	18.10%	13.70%	14.00%
	14.10%	7.90%	6.00%	6.10%	6.20%	6.80%	11.10%	13.40%	5.10%	10.50%	22.50%	7.70%	5.20%	9.00%	10.40%	11.60%	8.60%	3.80%	6.50%	11.30%	48.70%	18.20%	13.80%	14.00%
	15.50%	8.50%	6.20%	6.10%	6.20%	7.60%	14.10%	14.60%	7.20%	11.10%	25.20%	8.60%	5.70%	9.10%	11.40%	12.40%	9.40%	3.90%	7.70%	11.40%	49.00%	19.10%	14.90%	18.80%
Median	8.00%	4.00%	3.00%	3.00%	2.00%	3.20%	4.10%	8.00%	1.70%	6.30%	12.20%	3.80%	2.80%	5.80%	5.00%	7.40%	5.40%	1.60%	3.10%	7.80%	40.60%	13.00%	7.70%	7.00%
Lower quartile	6.90%	3.10%	2.20%	2.40%	1.60%	2.70%	3.30%	6.90%	1.10%	4.80%	10.80%	2.80%	2.30%	4.90%	4.10%	6.50%	4.90%	1.10%	2.50%	6.70%	38.20%	12.00%	6.70%	6.10%
Upper quartile	9.30%	5.20%	3.70%	3.60%	2.50%	3.90%	5.10%	9.00%	2.20%	7.60%	14.10%	4.90%	3.30%	6.60%	5.80%	8.30%	6.10%	2.10%	3.80%	8.60%	42.90%	14.00%	9.00%	8.40%
Interquartile range	2.40%	2.10%	1.50%	1.20%	0.90%	1.20%	1.80%	2.10%	1.10%	2.80%	3.30%	2.10%	1.00%	1.70%	1.70%	1.80%	1.20%	1.00%	1.30%	1.90%	4.70%	2.00%	2.30%	2.30%
Inner fence	12.90%	8.35%	5.95%	5.40%	3.85%	5.70%	7.80%	12.15%	3.85%	11.80%	19.05%	8.05%	4.80%	9.15%	8.35%	11.00%	7.90%	3.60%	5.75%	11.45%	49.95%	17.00%	12.45%	11.85%
Outer fence	16.50%	11.50%	8.20%	7.20%	5.20%	7.50%	10.50%	15.30%	5.50%	16.00%	24.00%	11.20%	6.30%	11.70%	10.90%	13.70%	9.70%	5.10%	7.70%	14.30%	57.00%	20.00%	15.90%	15.30%
Protein number in Tables S1 and S2	105	333	130	15	37	150	21	239	60	114	153	37	7	123	9	272	158					9	131	16
	178		259	18	60	151	42	331	61	120		94		22	142	12	273	160				42	132	20
	199			19	61	158	44		62	121		95		24	175	42		173				123	153	21
	222			20	74	167	48		64		222	142		195	194	103		277				142	163	24
	239			60	75	223	49		67		232	172		239	251	107		307				194	168	42
				61	76	224	136		68		253	176		247	254	144								44
				63	173	225	247		157		336	177		261	261	148								48
				131	274	226	296		165			201		297	329	149								49
				132	285	261								306	330	158								136
				151	289	306										162								247
				168	290	333										170								296
				331	291											171								
					293											295								
					294																			
					295																			
					301																			
					331																			

Median = Q2
 Lower quartile = Q1
 Upper quartile = Q3
 Interquartile range = Q3 - Q1
 Inner fence = Q3 + (Q3-Q1)*1.5
 Outer fence = Q3 + (Q3-Q1)*3

*An explanation for this table is given on the following page

Supplementary Table S3. Statistical test for upper outliers of amino acid content in human secondary transport proteins.

The values of amino acid content for each individual amino acid and for each group of amino acids with similar physicochemical properties (Supplementary Table S2) were ordered from smallest to largest. For each column of 336 values, those for the median (Q2), lower quartile (Q1) and upper quartile (Q3) were obtained and used to obtain the inner fence and outer fence values using the given equations. The top part of Table S3 shows the highest of the ordered values in each column and are coloured to highlight those that are above the inner fence values (pink) and above the outer fence values (red). Note that the rows of values in this table come from the ordered list and do not represent the same protein. The bottom part of Table S3 shows a list of the protein numbers in Supplementary Tables S1 and S2 that correspond with the amino acid contents that are above the inner fence (pink) and outer fence values (red). These protein numbers also correspond with the coloured dots in Figures 1 and 2 of the main paper that indicate proteins with statistically high contents of individual amino acids or groups of amino acids with similar physicochemical properties, respectively.

Supplementary Table S4. Average numbers for parameters in different human secondary transport protein families.

The thirty six different transporter families match those given in Supplementary Table S1 and in the legend for Figure 1. Average numbers (AVG) and standard deviations (STDEV) in each transporter family were calculated for the total number of residues in the proteins from the data shown in Figure 6A, the combined contents of hydrophobic, positively charged residues and negatively charged residues in the proteins from the data shown in Figures 6B, 6C and 6D, and the number of predicted transmembrane spanning helices in the proteins from the data shown in Figure 6E. In each column, the three highest values and the three lowest values are coloured red and blue, respectively. The bottom row of the table gives overall average values and standard deviations for all 336 transport proteins. Values with greatest statistical significance are highlighted yellow. The entries in this Table were used to plot the graphs shown in Figure 7.

Transporter family	Total number of residues		Hydrophobic residues		Positive residues		Negative residues		Number of TM helices	
	AVG	STDEV	AVG	STDEV	AVG	STDEV	AVG	STDEV	AVG	STDEV
AAAP	515.7	91.6	42.5%	2.8%	6.7%	1.0%	7.0%	1.3%	10.3	0.9
AE	1078.1	125.6	36.8%	2.0%	10.2%	1.1%	11.2%	1.3%	11.5	0.9
APC	552.3	68.5	44.6%	1.4%	6.4%	0.9%	6.2%	1.1%	12.6	0.9
ArsB	838.0		42.7%		8.4%		8.8%		12.0	
BASS	354.0	122.6	43.9%	2.7%	6.2%	1.5%	5.6%	0.7%	8.0	1.7
CaCA	791.1	211.2	38.8%	4.1%	8.2%	1.0%	10.9%	3.0%	10.3	0.9
CCC	1039.1	145.1	38.2%	2.1%	8.6%	1.1%	9.2%	1.3%	12.4	0.5
CDF	467.1	127.9	38.8%	2.8%	7.9%	1.8%	9.4%	1.8%	6.7	2.6
CIC	686.8	233.3	38.5%	1.7%	9.1%	1.2%	9.3%	1.1%	9.1	3.2
CNT	666.0	22.1	40.5%	3.4%	8.3%	0.6%	8.6%	1.6%	11.0	0.0
CPA1	702.0	212.8	39.9%	1.1%	8.7%	1.7%	9.1%	0.9%	10.3	3.0
CPA2	677.0		42.7%		10.3%		10.6%		13.0	
DAACS	548.1	18.2	43.3%	2.1%	8.1%	1.0%	8.5%	0.8%	8.6	0.8
DASS	596.4	20.9	42.9%	2.5%	6.9%	1.3%	6.5%	0.9%	13.6	1.1
DMT	356.2	38.9	43.5%	2.7%	7.8%	0.9%	5.6%	1.7%	8.8	1.1
ENT	479.3	35.0	43.6%	2.6%	6.5%	0.9%	6.3%	0.6%	11.0	0.0
GPH	518.0	42.3	42.2%	2.7%	7.0%	0.7%	6.4%	1.1%	11.7	0.6
LCT	307.0	84.9	44.7%	1.6%	6.8%	0.2%	4.4%	0.5%	7.0	1.4
MC	320.4	100.2	37.4%	2.4%	11.0%	1.1%	7.0%	1.5%	0.7	1.6
MET	270.7	42.7	39.3%	1.3%	8.7%	1.6%	6.9%	0.4%	4.0	0.0
MFS	515.9	80.4	41.6%	3.0%	7.2%	1.0%	6.8%	1.7%	11.1	1.7
MOP	586.0	22.6	44.8%	1.4%	6.4%	0.2%	5.7%	0.5%	13.0	0.0
MTC	329.0	9.6	39.0%	2.6%	9.2%	0.4%	7.0%	0.3%	3.3	1.2
NCS2	567.3	101.6	39.1%	1.9%	6.1%	1.1%	6.6%	0.8%	10.3	2.2
Nramp	555.5	7.8	43.8%	0.4%	6.5%	0.1%	6.8%	0.8%	12.0	0.0
NSS	614.9	100.5	40.0%	1.6%	6.7%	0.6%	7.0%	1.1%	11.5	1.8
OAT	697.9	62.4	37.2%	1.3%	8.1%	1.4%	7.1%	1.2%	11.9	0.3
OST	234.0	149.9	38.3%	3.3%	8.3%	0.7%	12.5%	9.0%	4.0	4.2
Oxa1	495.0		36.7%		10.7%		6.4%		5.0	
PIT	665.5	19.1	39.6%	1.6%	8.3%	0.5%	9.0%	0.0%	10.5	2.1
PNaS	664.5	36.1	41.6%	1.5%	8.0%	0.8%	6.4%	0.8%	10.0	2.8
POT	648.8	81.0	41.4%	2.5%	8.0%	0.5%	6.3%	1.3%	11.8	0.5
RFC	377.7	205.8	38.6%	7.5%	6.6%	1.0%	7.4%	1.7%	8.3	6.4
SSS	642.2	46.2	41.8%	0.7%	6.5%	1.0%	6.6%	1.2%	13.2	0.9
SulP	689.1	207.7	40.3%	3.5%	8.4%	0.9%	8.2%	1.1%	9.6	3.5
ZIP	316.5	10.6	47.5%	1.7%	5.4%	0.2%	7.4%	0.0%	8.0	0.0
Overall	533.9	212.0	40.5%	3.40%	8.0%	1.8%	7.4%	2.0%	9.3	4.1