

ДОПОЛНИТЕЛЬНЫЕ МАТЕРИАЛЫ

Бунеева О.А., Копылов А.Т., Згода В.Г., Гнеденко О.В., Калошина С.А., Медведева М.В., Иванов А.С., Медведев А.Е. (2022) Биомедицинская химия, 68(1), 18-31.

SUPPLEMENT

Buneeva O.A., Kopylov A.T., Zgoda V.G., Gnedenko O.V., Kaloshina S.A., Medvedeva M.V., Ivanov A.S., Medvedev A.E. (2022) Biomeditsinskaya khimiya, 68(1), 18-31.

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Table 1a. Proteins associated with rabbit brain 26S proteasomes

№	Accession (Uniprot)	Protein name (Uniprot)	Gene	Coverage	Peptides	Unique peptides	PSMs	Score	MW (kDa)	Ubiquitination
Other UPS components										
1	P62975	Ubiquitin	UBIQ	32,89	2	2	3	Infinity	8,565	K48
2	Q29504	Ubiquitin-like modifier-activating enzyme 1	UBA1	2,17	2	3	3	41.174	117,688	
3	G1TSL5	Ubiquitin recognition factor in ER associated degradation 1	UFD1	4,23	2	2	2	29.558	34,478	
4	G1THY3	Ubiquitin conjugating enzyme E2 V1	UBE2V1	6,76	2	2	2	Infinity	16,645	
5	G1TEW4	Ubiquitin specific peptidase 9, X-linked	USP9X	1,52	7	7	8	Infinity	292,129	
6	G1SK00	Ubiquitinyl hydrolase 1	USP5	7,72	12	12	16	Infinity	96,317	
7	G1SZR6	Cullin 3	CUL3	13,77	6	6	7	Infinity	89,183	
8	G1SN14	Cullin associated and neddylation dissociated 1	CAND1	6,88	10	10	11		133,529	
9	G1SFN0	BRCA1 associated RING domain 1	BARD1							
10	G1SPR2	Aldo_ket_red domain-containing protein	N/A	33,23	12	12	13	Infinity	36,92	K153
Metabolic enzymes										
1	B7NZE9	Creatine kinase, mitochondrial 1A (Predicted)	CKMT1A	11,75	5	4	6	Infinity	46,992	
2	P00563	Creatine kinase M-type	CKM	13,12	8	1	12	Infinity	43,085	
3	P00567	Creatine kinase B-type	CKB	28,61	11	0	19	Infinity	42,636	
4	Q03505	Alcohol dehydrogenase 1	ADH1	19,73	8	8	29	Infinity	39,588	K2 K136
5	P13491	L-lactate dehydrogenase A chain	LDHA	3,61	1	0	1	Infinity	36,541	
6	G1TYA7	L-lactate dehydrogenase	LDHB	26,59	10	10	11	Infinity	36,611	
7	P11974	Pyruvate kinase PKM	PKM	11,86	9	7	10	126.435	58,011	K322

8	P00939	Triosephosphate isomerase	TPI1	31,85	8	8	10	Infinity	26,609	
9	P00883	Fructose-bisphosphate aldolase A	ALDOA	24,73	11	10	15	Infinity	39,318	
10	G1T652	Fructose-bisphosphate aldolase	ALDOC	17,58	7	7	9	Infinity	39,336	
11	P00637	Fructose-1,6-bisphosphatase 1	FBP1	25,74	8	6	9	Infinity	36,554	
12	P00489	Glycogen phosphorylase, muscle form	PYGM	5,58	6	0	8	Infinity	97,228	
13	P00511	ATP-dependent 6-phosphofructokinase, muscle type	PFKM	7,18	7	5	8	Infinity	85,149	
14	G1U7S4	Phosphoglycerate mutase	PGAM2	8,3	4	0	4	Infinity	28,649	
15	G1TDS5	Glutamate decarboxylase 2	GAD2	3,25	3	3	3	37.673	65,321	
16	G1SQG5	Malate dehydrogenase	MDH1	10,18	5	5	7	78.522	36,472	
17	G1T5L6	Phosphodiesterase	NCKAP1L	2,38	6	6	6	Infinity	190,880	
18	G1T1V5	Carbonic anhydrase 3	CA3	4,46	2	2	2	39.626	30,348	
19	G1SZ63	Aldehyde dehydrogenase 9 family member A1	ALDH9A1	7,08	3	2	3	44.663	46,439	
20	G1SIY9	Aldehyde dehydrogenase 5 family member A1	ALDH5A1	11,49	6	6	6	Infinity	55,951	
21	G1T8P1	Aldehyde dehydrogenase 1 family member L1	ALDH1L1	4,75	8	6	9	Infinity	105,92	
22	Q75NJ2	Aldehyde dehydrogenase	aldDH	24,4	27	24	33	Infinity	54,419	
23	G1SNJ9	Phosphoglycerate kinase	PGK2	9,83	4	0	4	Infinity	44,732	
24	G1SYJ4	Enolase 1	ENO1	6,45	6	5	6	Infinity	47,243	
25	G1SK04	Enolase 2	ENO2	8,76	3	2	5	Infinity	47,194	
26	P46406	Glyceraldehyde-3-phosphate dehydrogenase	GAPDH	23,42	10	10	16	Infinity	35,757	
27	G1SPL1	D-3-phosphoglycerate dehydrogenase	PHGDH	5,07	3	2	3	Infinity	56,426	
28	G1T7Z0	6-phosphogluconate dehydrogenase, decarboxylating	PGD	6,83	4	3	4	Infinity	69,893	
29	G1SI20	Isocitrate dehydrogenase [NADP]	IDH1	25,54	11	8	11	Infinity	46,865	
30	P00949	Phosphoglucomutase-1	PGM1	16,37	6	6	6	Infinity	61,519	
31	G1TVT8	Glycerol-3-phosphate dehydrogenase [NAD(+)]	GPD1	14,94	6	6	7	Infinity	37,283	
32	G1TA59	Isocitrate dehydrogenase [NAD] subunit,	IDH3A	11,75	5	5	5	Infinity	39,645	

		mitochondrial								
33	Q95KM0	Arginase-1	ARG1	26,71	9	9	10	Infinity	34,427	
34	G1SG64	Arginase	ARG1	20,41	9	9	10	Infinity	36,166	
35	G1SVB6	Glutamate dehydrogenase	GLUD1	29,78	17	17	25	Infinity	49,489	
36	G1TEA7	Carbamoyl-phosphate synthase 1	CPS1	2,65	4	4	4	Infinity	165,44	
37	G1T060	Hydroxysteroid 17-beta dehydrogenase 4	HSD17B4	1,77	3	3	3	28,82	79,68	
38	G1TZE2	Maleylacetoacetate isomerase	GSTZ1	46,08	9	8	10	Infinity	24,256	K12 K64
39	G1T4Z2	ATP-citrate synthase	ACLY	14,14	14	11	14	Infinity	119,255	K6 K369
40	G1T678	Acetyl-CoA acetyltransferase 2	ACAT2	4,48	4	4	4	Infinity	41,33	
41	G1SQ01	Aldo-keto reductase family 1 member A1	AKR1A1	4,44	2	2	2	Infinity	47,05	
42	G1SW00	Glutamate-ammonia ligase	GLUL	33,03	15	15	39	Infinity	37,45	
43	G1SVH0	Adenosylhomocysteinase	AHCY	12,31	9	8	13	Infinity	58,47	
44	G1T332	Aspartate aminotransferase	GOT1	8,23	5	5	5	75,11	46,43	
45	G1SMM6	Betaine--homocysteine S-methyltransferase	BHMT	5,94	2	2	2	Infinity	44,3	
46	G1SWV6	Argininosuccinate lyase	N/A	5,16	6	6	6	62,79	70,72	
47	G1SUY2	Aldedh domain-containing protein	ALDH2	5,82	4	3	6	51,25	54,43	
Components of cytoskeleton and transport proteins										
1	G1SNP7	Microtubule associated protein 1A	MAP1A	14,87	44	43	59	Infinity	313,541	
2	G1T892	Microtubule associated protein RP/EB family member 3	MAPRE3	24,56	8	6	11	Infinity	31,959	
3	G1SJF5	Microtubule associated protein 6	MAP6	18,7	12	12	13	Infinity	94,114	
4	G1SKS8	Microtubule-associated protein	MAP4	1,38	4	4	4	Infinity	129,842	
5	G1TQR0	Actinin alpha 1	ACTN1	29,15	34	19	49	Infinity	102,946	
6	G1TUC8	Actinin alpha 4	ACTN4	24,06	22	9	31	Infinity	87,388	

7	P29751	Actin, cytoplasmic 1	ASTB	51,2	25	4	98	Infinity	41,756	K17 K18
8	G1SKS0	Actin-related protein 2/3 complex subunit	ARPC1A	6,49	3	3	5	Infinity	41,542	
9	G1T4C2	Dynamin 1	DNM1	43,83	26	20	46	Infinity	51,765	
10	G1T0B7	Tubulin alpha chain	N/A	30,53	37	0	126	Infinity	46,215	
11	G1TKC3	Tubulin alpha chain	N/A	55,23	37	32	67	Infinity	49,787	K112
12	G1TR82	Tubulin alpha chain	TUBA4A	59,6	63	7	284	Infinity	49,893	
13	G1SY02	Tubulin beta chain	TUBB2A	69,21	77	3	227	75,578	49,874	
14	G1SH05	Tubulin beta chain	TUBB	65,99	72	7	212	Infinity	49,694	
15	G1U410	Tubulin beta chain	TUBB4A	71,17	80	15	229	Infinity	49,55	
16	G1T346	Spectrin alpha, non-erythrocytic 1	SPTAN1	46,83	129	129	172	Infinity	289,345	K10 K2494
17	G1T7I5	Spectrin beta chain	SPTBN2	13,44	36	30	43	Infinity	270,709	
18	G1SN11	Spectrin beta chain	SPTBN1	19,42	69	61	98	Infinity	271,101	
19	G1SCI0	Dynein cytoplasmic 1 heavy chain 1	DYNC1 H1	18,87	75	75	102	Infinity	378,292	
20	G1SWS9	Vimentin	VIM	14,38	11	8	11	Infinity	53,622	
21	G1T926	Dynactin subunit 1	DCTN1	9,84	16	16	16	Infinity	142,154	
22	G1T0Y9	Dynactin subunit 2	DCTN2	24,63	15	15	23	Infinity	44,209	
23	G1SD49	Dynactin subunit 3	DCTN3	23,66	6	6	6	101,394	21,162	
24	G1SRP7	Importin subunit alpha	KPNA3	5,72	5	5	8	Infinity	61,848	
25	G1T868	Clathrin light chain	CLTB	12,39	3	3	3	Infinity	24,852	
26	G1TBL	Clathrin heavy chain	CLTC	28,35	60	45	102	Infinity	216,956	
27	G1T5W9	Hippocalcin	HPCA	6,05	3	2	4	Infinity	43,143	K378
28	G1STJ8	Myosin VA	MYO5A	3,25	8	6	8	Infinity	217,914	K941 K949
29	G1TS36	Membrane palmitoylated protein 6	MPP6	9,93	6	5	6	Infinity	62,648	K540
30	B7NZJ1	Copine 1		3,72	3	3	3	Infinity	59,099	K10
31	G1U9I8	Cytokeratin-1	KRT1	9	8	0	20	64,34	64,19	
32	G1SER8	Profilin	PFN1	41,84	4	4	6	86,35	10,6	
33	Q6PNB6	Guanine nucleotide-	GNB5	3,4	2	2	2	Infinity	38,731	

		binding protein subunit beta-5								
34	G1TFL3	GTP-binding nuclear protein Ran		6,06	1	1	2	27,580	18,884	
35	Q9N0Z6	Sodium/potassium -transporting ATPase subunit alpha-1	ATP1A1	4,69	5	3	5	Infinity	112,922	
36	Q9TT37	Sodium/potassium -transporting ATPase subunit beta-1	ATP1B1	7,26	4	4	4	Infinity	34,918	
37	G1SR29	ATPase H+ transporting V1 subunit A	ATP6V1 A	33,08	17	17	23	Infinity	58,089	K7 K468
38	G1SEJ4	ATPase H+ transporting V1 subunit B2	ATP6V1 B2	38,16	22	22	29	Infinity	56,367	
39	G1SS33	ATPase H+ transporting V1 subunit E1	ATP6V1 E1	32,74	9	9	16	Infinity	26,127	
40	G1SUT0	Transportin 2	TNPO2	2,22	4	0	5	Infinity	100,898	
41	G1TEH2	V-type proton ATPase subunit C	ATP6V1 C1	18,06	11	11	12	Infinity	43,946	
42	O97755	V-type proton ATPase subunit D	ATP6V1 D	14,98	6	6	7	Infinity	28,235	
43	G1T239	V-type proton ATPase subunit D1	ATP6V0 D1	6,84	2	2	2	Infinity	40,303	
44	G1T6S6	V-type proton ATPase subunit F	ATP6V1 F	26,89	4	4	5	Infinity	13,336	
45	G1TZF3	V-type proton ATPase subunit G	ATP6V1 G2	13,92	2	2	2	Infinity	17,066	
46	G1TBC4	V-type proton ATPase subunit H	ATP6V1 H	17,18	8	8	9	Infinity	55,886	
Proteins of signal transduction and regulation of enzyme activity										
1	G1SDW8	CD44 antigen	CD44	2,04	1	2	2	Infinity	80,708	K606
2	G1T9B9	Neurofascin	NFASC	2,66	4	3	4	Infinity	158,626	K587 K1244
3	G1SZD6	14-3-3 protein theta	YWHAQ	49,8	17	11	43	Infinity	27,758	
4	P62160	Calmodulin	CALM	18,79	4	4	4	Infinity	16,826	
5	G1T1Z6	Cytoplasmic FMR1-interacting protein	CYFIP2	10,22	23	15	30	Infinity	145,579	K10
6	G1TXG3	ArfGAP with GTPase domain, ankyrin repeat and PH domain 3	AGAP3	4,38	7	3	7	Infinity	93,668	K453
7	G1SIT9	Tyrosine 3-monooxygenase/tr	YWHAB	23,58	8	2	13	46,46	28,06	

		typtophan 5-monooxygenase activation protein beta								
8	G1T7R2	Tyrosine 3-monooxygenase/tr yptophan 5-monooxygenase activation protein epsilon	YWHAE	47,06	15	12	21	Infinity	29,17	
9	G1SE57	ADP ribosylation factor 4	ARF4	11,67	3	1	6	Infinity	20,5	
Protective proteins										
1	G1TQP4	Heat shock protein family A (Hsp70) member 12A	HSPA12 A	8,67	10	10	11	Infinity	76,841	
2	G1T3Y8	Heat shock protein family D (Hsp60) member 1	HSPD1	15,92	11	11	12	Infinity	56,632	
3	G1SMM5	DnaJ heat shock protein family (Hsp40) member A2	DNAJA2	7,52	3	3	5	Infinity	45,730	
4	P30947	Heat shock protein HSP 90-beta	HSP90A B1	16,67	15	3	20	Infinity	83,415	
5	P30946	Heat shock protein HSP 90-alpha	HSP90A A1	15,56	16	9	24	Infinity	79,683	
6	G1SYE2	DnaJ heat shock protein family (Hsp40) member C6	DNAJC6	7,49	6	6	7	Infinity	92,313	
7	G1T1V9	Heat shock protein family A (Hsp70) member 2	HSPA2	17,01	16	3	33	30,838	69,610	
8	G1T9M9	Heat shock protein family A (Hsp70) member 8	HSPA8	45,22	39	28	75	Infinity	71,038	
9	B6V9S9	Chaperonin containing TCP1 subunit 2	CCT2	2,24	2	2	2	25,55	57,42	
10	P11909	Glutathione peroxidase 1	GPX1	34	4	4	5	Infinity	21,869	
11	G1T0R9	Glutathione S-transferase	GSTM3	6,42	3	3	4	Infinity	25,481	
12	Q08863	Glutathione S-transferase alpha I		12,11	2	2	4	Infinity	25,67	
13	Q08862	Glutathione S-transferase Yc		18,55	5	4	5	Infinity	25,43	
14	P46409	Glutathione S-transferase Mu 1	N/A	20,18	7	8	9	Infinity	25,401	

15	G1U9R0	Glutathione S-transferase pi 1	GSTP1	0	3	3	3	Infinity	23,48	
16	O62648	Sulfotransferase	N/A	2,75	1	1	1	Infinity	33,561	
17	Q95KM3	Sulfotransferase	N/A	17,63	6	4	8	Infinity	34,171	
18	G1T6W7	Catalase	CAT	6,07	2	2	3	Infinity	59,619	
19	G1SPZ7	Glutathione peroxidase	N/A	26,21	3	3	4	Infinity	16,167	
20	G1SHZ8	Chaperonin containing TCP1 subunit 8	CCT8	6,12	4	4	5	Infinity	60,62	
21	G1SQ02	Peroxiredoxin 1	PRDX1	33,67	10	10	16	Infinity	22,14	
22	G1T8Z0	Peroxiredoxin 6	PRDX6	8,81	3	3	4	46,27	25,23	
23	P08628	Thioredoxin	TXN	20,95	2	2	2	Infinity	11,752	
24	G1SRF7	Heat shock protein family A (Hsp70) member 9	HSPA9	5,01	3	3	3	Infinity	73,537	
25	G1T3V2	Heat shock 27 kDa protein	HSPB1	19,12	5	5	7	74,91	22,59	
26	G1U9S7	T-complex protein 1 subunit alpha	TCP1	3,24	2	2	2	36,473	60,221	
27	G1U9T8	T-complex protein 1 subunit delta	CCT4	5,88	3	3	4	Infinity	56,988	
28	G1SCN8	T-complex protein 1 subunit gamma	CCT3	6,06	4	4	6	Infinity	60,550	
29	O77622	T-complex protein 1 subunit zeta	CCT6	6,21	4	4	4	54,868	57,988	
30	G1THZ6	Immunoglobulin heavy constant mu	IGHM	10,42	4	4	6	Infinity	51,94	
31	G1U974	Dihydropyrimidinase like 2	DPYSL2	45,98	40	34	98	Infinity	62,27	
32	Q9TTC6	Peptidyl-prolyl cis-trans isomerase A	PPIA	30,49	5	5	8	128,5	17,82	
Protein regulators of gene expression, cell division, and differentiation										
1	G1SK22	40S Ribosomal protein S27a	RPS27A	30,13	6	6	21	Infinity	17,953	K6
2	G1TGI6	40S ribosomal protein SA	RPSA	4,38	1	0	1	Infinity	33,115	
3	P68105	Elongation Factor 1-alpha 1	EEF1A1	16,23	7	7	14	Infinity	50,109	
4	P34826	Elongation factor 1-beta	EEF1B	4	2	2	3	Infinity	24,733	
5	P29694	Elongation factor 1-gamma	EEF1G	18,99	10	10	15	Infinity	50,017	

6	P53787	Elongation factor 1-delta	EEF1D	11,79	3	3	3	Infinity	31,055	
7	G1T336	DEAD-box helicase 3, X-linked	DDX3X	4,23	4	4	4	Infinity	73,108	
8	G1SQZ4	RuvB-like helicase	RUVBL2	8,86	5	5	5	Infinity	51,125	
9	G1SMY1	DEAD-box helicase 17	DDX17	19,54	17	16	19	Infinity	72,310	
10	G1SMM7	Small nuclear ribonucleoprotein D3 polypeptide	SNRPD3	7,94	2	2	2	Infinity	13,907	
11	G1SGB5	Splicing factor proline and glutamine rich	SFPQ	17,13	11	10	12	Infinity	57,332	
12	G1TWL0	Heterogeneous nuclear ribonucleoprotein A2/B1	HNRNP A2B1	25,21	12	9	14	Infinity	37,386	
13	G1TAW7	G1TAW7_RABIT Eukaryotic translation initiation factor 2 subunit 1	EIF2A	4,79	3	2	4	Infinity	64,840	K6 K12
14	G1SZ03	Eukaryotic translation initiation factor 3 subunit B	EIF3B	2,8	2	2	2	Infinity	78,591	
15	O77768	Heterogeneous nuclear ribonucleoprotein C	HNRNP C	12,75	7	7	7	Infinity	33,664	
16	G1SLT8	Heterogeneous nuclear ribonucleoprotein H3	HNRNP H3	5,49	2	2	3	Infinity	36,903	
17	G1TD41	Heterogeneous nuclear ribonucleoprotein H1	HNRNP H1	7,8	5	5	7	Infinity	49,198	
18	O19049	Heterogeneous nuclear ribonucleoprotein K	HNRNP K	29,16	17	17	31	Infinity	50,928	
19	G1SN68	Glutamyl-tRNA synthetase	QARS	6,19	4	4	4	Infinity	87,320	
20	G1T846	Aspartyl-tRNA synthetase	DARS	6,99	6	6	7	Infinity	57,220	
21	G1T214	Glutamyl-prolyl-tRNA synthetase	EPRS	3,64	10	10	10	Infinity	170,236	
22	G1TWP4	Valyl-tRNA	VARS	2,86	5	5	6	Infinity	139,085	

		synthetase								
23	G1U7U3	Nucleoside diphosphate kinase	NME1	7,84	1	0	1	27,72	17,3	

Table 2a. Proteins associated with rabbit brain 20S proteasomes

№	Accession (Uniprot)	Protein name (Uniprot)	Gene	Coverage	Peptides	Unique peptides	PSMs	Score	MW (kDa)	Ubiquitination
Other UPS components										
1	P62975	Ubiquitin	UBIQ	72,37	7	6	8	Infinity	8,565	K48
2	Q29504	Ubiquitin-like modifier-activating enzyme 1	UBA1	25,8	29	29	43	Infinity	117,688	
3	U3KNK3	Ubiquitin conjugating enzyme E2 D2	UBE2D2	7,48	1	1	2	Infinity	16,724	
4	G1U3G0	Ubiquitin conjugating enzyme E2 O	UBE2O	0,78	3	3	3	39,799	140,599	
5	G1SPV0	Ubiquitin conjugating enzyme E2 K	UBE2K	10,5	3	3	3	Infinity	22,39	
6	G1THY3	Ubiquitin conjugating enzyme E2 V1	UBE2V1	19,59	3	1	4	Infinity	16,645	
7	G1T107	UBC core domain-containing protein	UBE2N	41,55	9	9	12	Infinity	15,99	
8	G1SK00	Ubiquitinyl hydrolase 1	USP5	5,41	5	5	6	Infinity	96,317	
9	G1TIZ1	Ubiquitin carboxyl-terminal hydrolase	UCHL1	19,73	6	6	8	Infinity	24,844	
10	P40826	Ubiquitin carboxyl-terminal hydrolase 14	USP14	2,64	1	1	1	Infinity	55,922	
11	G1U8C4	Proteasome activator subunit 1	PSME1	4,82	2	2	2	Infinity	28,642	
12	G1SN14	Cullin associated and neddylation dissociated 1	CAND1	9,04	14	12	15	Infinity	133,529	
13	P13019	Bleomycin hydrolase (Fragment)	BLMH	5,42	2	2	2	Infinity	32,579	K224
Metabolic enzymes										
1	P11974	Pyruvate kinase PKM	PKM	54,8	2	0	116	Infinity	58,048	K322
2	G1SQD3	Pyruvate kinase	PKM	54,24	49	0	102	Infinity	64,513	K386
3	P00883	Fructose-bisphosphate aldolase A	ALDOA	57,14	41	34	72	Infinity	39,318	
4	P79226	Fructose-bisphosphate aldolase B	ALDOB	14,01	6	5	6	Infinity	39,580	
5	G1T652	Fructose-bisphosphate aldolase	ALDOC	51,92	41	34	84	Infinity	39,336	
6	P13491	L-lactate dehydrogenase A chain	LDHA	39,76	24	18	41	Infinity	36,541	
7	G1TZK5	L-lactate dehydrogenase	LDHAL6B	5,56	5	3	9	71,550	41,482	

8	G1TYA7	L-lactate dehydrogenase	LDHB	30,21	23	19	50	Infinity	36,611	
9	G1SYJ4	Enolase 1	ENO1	51,15	29	0	108	Infinity	47,243	
10	G1T659	Enolase-phosphatase E1	ENOPH1	3,63	1	1	1	Infinity	36,287	
11	G1SK04	Enolase 2	ENO2	61,29	44	37	131	Infinity	47,194	
12	P00939	Triosephosphate isomerase	TPH1	42,74	11	11	15	Infinity	26,609	
13	P46406	Glyceraldehyde-3-phosphate dehydrogenase	GAPDH	33,93	19	19	36	Infinity	35,757	
14	G1T1V5	Carbonic anhydrase 3	CA3	17,1	4	0	4	Infinity	30,348	
15	G1SVY8	Creatine kinase B-type	CKB	53,54	46	45	242	Infinity	42,712	
16	P00563	Creatine kinase M-type	CKM	5,77	5	2	9	Infinity	43,085	
17	G1SNJ9	Phosphoglycerate kinase	PGK2	12,95	5	0	10	Infinity	44,732	
18	P00489	Glycogen phosphorylase, muscle form	PYGM	5,58	6	0	7	Infinity	97,228	
19	Q03505	Alcohol dehydrogenase 1	ADH1	34,93	21	18	24	Infinity	39,563	
20	O19053	Alcohol dehydrogenase class-3	ADH5	4,55	4	2	5	Infinity	39,570	
21	G1U460	Aldehyde dehydrogenase 6 family member A1	ALDH6 A1	4,06	2	2	2	Infinity	61,489	
22	G1SZ63	Aldehyde dehydrogenase 9 family member A1	ALDH9 A1	13,68	10	9	13	Infinity	46,439	
23	P00511	ATP-dependent 6-phosphofructokinase , muscle type	PFKM	21,15	22	0	32	Infinity	85,149	
24	G1TVT8	Glycerol-3-phosphate dehydrogenase [NAD(+)]	GPD1	7,47	4	4	6	Infinity	37,283	
25	G1SYK0	Glycerol-3-phosphate dehydrogenase [NAD(+)]	GPD1L	3,59	1	0	1	Infinity	36,813	
26	G1T765	Malate dehydrogenase	MDH2	49,7	18	18	41	Infinity	35,463	
27	G1SQG5	Malate dehydrogenase	MDH1	34,43	17	17	34	Infinity	36,472	
28	B7NZE9	Creatine kinase, mitochondrial 1A (Predicted)	CKMT1 A	7,43	8	6	11	Infinity	46,99	
29	G1T7Z0	6-phosphogluconate dehydrogenase, decarboxylating	PGD	6,06	5	5	5	Infinity	69,89	
30	G1SI20	Isocitrate dehydrogenase [NADP]	IDH1	10,36	10	9	13	Infinity	46,87	
31	P00949	Phosphoglucomutase-1	PGM1	18,68	15	15	22	Infinity	61,52	
32	G1TA59	Isocitrate dehydrogenase [NAD] subunit, mitochondrial	IDH3A	6,28	2	2	2	Infinity	39,65	
33	G1SVB6	Glutamate dehydrogenase	GLUD1	20,67	13	13	18	Infinity	49,49	
34	G1T545	Lactoylglutathione lyase	GLO1	32,09	4	4	4	Infinity	20,934	K160
35	G1TC46	S-adenosylmethionine synthase	MAT1A	7,52	3	1	3	Infinity	43,917	
36	G1SHD6	S-adenosylmethionine synthase	MAT2A	9,15	5	3	5	Infinity	36,306	
37	G1TAH7	Transketolase	TKT	37,56	26	26	38	Infinity	67,66	
38	G1SYL1	Adenosine	ADA	7,38	3	3	3	Infinity	41,28	

		deaminase								
39	P12345	Aspartate aminotransferase, mitochondrial	GOT2	2,79	2	2	3	Infinity	47,38	
40	G1SFV1	Protein disulfide-isomerase	PDIA4	5,41	3	3	4	Infinity	66,7	
41	Q9N1E2	Glucose-6-phosphate isomerase	GPI	27,96	24	24	39	Infinity	62,71	
42	G1T4H3	Protein disulfide isomerase family A member 6	PDIA6	3,18	1	1	2	Infinity	47,97	
43	G1TEA7	Carbamoyl-phosphate synthase 1	CPS1	1,33	5	5	5	63,32	165,44	
44	G1TXI0	Peptidylprolyl isomerase	FKBP11	5,87	2	0	10	Infinity	40,17	
45	G1SQM2	Epoxide hydrolase 2	EPHX2	13,75	8	8	10	Infinity	67,62	
46	G1T332	Aspartate aminotransferase	GOT1	46,25	25	25	39	Infinity	46,43	
47	G1SIB9	Alpha-1,4 glucan phosphorylase	PYGB	21,15	21	15	31	Infinity	95,84	
48	G1SZF7	Isocitrate dehydrogenase [NADP]	IDH2	9,51	6	5	8	Infinity	50,8	
49	G1T373	Ribose-phosphate diphosphokinase	PRPS1	14,95	7	7	9	Infinity	35,07	
50	G1T386	Guanine deaminase	GDA	18,72	10	10	13	Infinity	51,1	
51	G1SZL3	4-aminobutyrate aminotransferase	ABAT	8,2	7	7	11	Infinity	56,32	
52	G1U6B2	Delta-aminolevulinic acid dehydratase	ALAD	6,06	3	3	3	51,08	36,06	
53	G1SRB6	Peptidylprolyl isomerase D	PPID	15,95	9	9	12	Infinity	41,04	
54	G1SQ01	Aldo-keto reductase family 1 member A1	AKR1A1	13,79	9	8	13	Infinity	47,05	
55	G1SYA5	S-formylglutathione hydrolase	ESD	22,14	7	7	11	Infinity	31,29	
56	G1T1U7	Methylenetetrahydrofolate dehydrogenase, cyclohydrolase and formyltetrahydrofolate synthetase 1	MTHFD1	2,35	4	4	4	Infinity	101,19	
57	G1U7U3	Nucleoside diphosphate kinase	NME1	52,94	8	3	13	Infinity	17,3	
58	G1T4S5	Cytidine monophosphate N-acetylneuraminic acid synthetase	CMAS	4,04	5	5	6	Infinity	55,2	
59	G1T5B9	Nudix hydrolase 3	NUDT3	17,14	2	2	2	Infinity	15,67	
60	G1SSV4	Phosphoinositide phospholipase C	PLCB1	5,18	13	13	14	Infinity	123,23	
61	G1SLQ3	NAD(PH) quinone dehydrogenase 1	NQO1	14,91	6	6	8	Infinity	31,07	
62	G1U2R2	Aminopeptidase	NPEPPS	22,37	26	26	45	Infinity	103,36	
63	G1TIC9	Sulfurtransferase	TST	20,54	4	4	5	Infinity	33,22	
64	G1SFI7	Guanine monophosphate synthase	GMPS	0	1	1	1	Infinity	76,61	
65	G1SWF2	Argininosuccinate synthase 1	ASS1	4,61	4	4	5	63,05	46,76	
66	G1SFJ8	Fatty acid binding protein 7	FABP7	32,58	5	4	6	Infinity	14,93	
67	G1SXT1	Adenosylhomocysteinase	AHCYL1	6,05	5	0	7	Infinity	61,87	
68	G1T7Z6	Phosphoglycerate kinase	PGK1	25,36	16	0	26	Infinity	44,68	
69	G1SDF2	Protein-L-isoaspartate O-methyltransferase	PCMT1	15,63	6	6	6	Infinity	30,35	
70	P10658	Phosphoserine aminotransferase	PSAT1	21,89	12	12	15	Infinity	40,59	
71	G1SUK4	Mannose-6-phosphate isomerase	MPI	7,44	4	4	4	Infinity	54,73	
72	G1SLZ8	Tyrosine-protein phosphatase non-	PTPN11	3,2	5	5	5	Infinity	68,02	

		receptor type									
73	G1SDD0	Enoyl-CoA hydratase, short chain 1	ECHS1	7,59	3	3	3	Infinity	31,25		
74	G1SXZ7	Fumarate hydratase, mitochondrial	N/A	4,07	3	3	3	Infinity	52,56		
75	Q8MI17	Retinal dehydrogenase 1	ALDH1 A1	19,76	11	10	22	Infinity	54,31		
76	G1U8R2	2-iminobutanoate/2-iminopropanoate deaminase	N/A	37,23	4	4	7	Infinity	14,46		
77	G1T3P1	Acyl-CoA thioesterase 7	ACOT7	16,07	5	5	7	Infinity	37,12		
78	G1TUX2	Aconitate hydratase, mitochondrial	ACO2	20,43	20	20	25	Infinity	87,29		
79	G1T489	Acid phosphatase 1	ACPI	12,12	2	2	3	Infinity	18,74		
80	G1SH26	Glyoxalase domain containing 4	GLOD4	6,25	3	3	4	Infinity	42,26		
81	G1SPF5	Phosphoglycerate mutase 1	PGAM1	46,15	20	20	32	Infinity	23,63		
82	G1SPH6	Phosphoglucomutase 2 like 1	PGM2L1	17,52	13	13	16	Infinity	70,37		
83	G1TJS2	Phospholipase D family member 3	PLD3	6,72	3	3	4	Infinity	51,34		
84	G1SP01	Prolyl endopeptidase like	PREPL	3,44	3	3	3	Infinity	84,1		
85	P15122	Aldose reductase	AKR1B1	17,72	10	8	12	Infinity	35,74		
86	G1SNH7	Dihydropteridine reductase	QDPR	20,9	7	7	10	Infinity	25,95		
87	G1TLL9	Non-specific serine/threonine protein kinase	PAK1	11,4	7	4	9	Infinity	60,6		
88	G1TCZ8	Protein phosphatase 2 scaffold subunit Aalpha	PPP2R1 A	16,75	9	6	9	Infinity	65,95		
89	O46650	Alcohol dehydrogenase class-2 isozyme 2	ADH2-2	5,54	6	3	6	Infinity	40,47		
90	G1SP54	Leukotriene A(4) hydrolase	LTA4H	8,18	6	6	6	Infinity	69,05		
91	G1SKV7	Carnosine dipeptidase 2	CNDP2	13,28	7	7	9	Infinity	55,27		
92	G1SCT1	Prolyl endopeptidase	PREP	1,24	4	4	4	45,763 208	72,97		
93	P80912	Histidine triad nucleotide-binding protein 1	HINT1	17,46	5	5	5	Infinity	13,68		
94	G1T678	Acetyl-CoA acetyltransferase 2	ACAT2	20,65	7	7	9	Infinity	41,33		
95	G1TI71	UTP--glucose-1-phosphate uridylyltransferase	UGP2	21,17	15	15	19	Infinity	57,44		
96	G1SES9	5-aminoimidazole-4-carboxamide ribonucleotide formyltransferase/IMP cyclohydrolase	ATIC	6,08	8	8	11	Infinity	64,63		
97	G1SW00	Glutamate-ammonia ligase	GLUL	16,22	6	6	6	Infinity	37,45		
98	G1SE39	Secernin 1	SCRN1	20,05	9	8	13	Infinity	46,34		
99	G1TPW2	Methylthioribose-1-phosphate isomerase	MRI1	6,3	2	2	2	Infinity	38,66		
100	G1SVH0	Adenosylhomocysteinase	AHCY	15,3	13	12	18	Infinity	58,47		
101	G1SCE2	Inositol polyphosphate-1-phosphatase	INPP1	6,53	4	4	4	Infinity	43,93		
Components of cytoskeleton and transport proteins											
1	G1T892	Microtubule associated protein RP/EB family member 3	MAPRE3	3,2	1	0	1	Infinity	31,96		
2	G1SNP7	Microtubule associated protein 1A	MAP1A	8,07	26	25	32	Infinity	313,54		

3	G1TR82	Tubulin alpha chain	TUBA4A	52,68	37	4	104	Infinity	49,89	
4	G1TOB7	Tubulin alpha chain	N/A	29,33	25	0	63	Infinity	46,22	
5	G1SH05	Tubulin beta chain	TUBB	53,83	50	4	128	Infinity	49,69	
6	G1T4J4	Tubulin beta chain	TUBB2B	58,43	58	3	136	Infinity	49,92	
7	G1U5S4	Tubulin beta chain	TUBB3	50,23	45	14	114	Infinity	48,49	
8	G1U410	Tubulin beta chain	TUBB4A	56,76	54	8	128	Infinity	49,55	
9	G1SY02	Tubulin beta chain	TUBB2B	58,43	57	2	140	Infinity	49,87	
10	G1SIX4	Tubulin polymerization promoting protein	TPPP	42,11	4	4	6	Infinity	12,59	
11	G1SKS0	Actin-related protein 2/3 complex subunit	ARPC1A	11,08	5	5	6	Infinity		
12	G1U5Q7	Actin-related protein 2/3 complex subunit 4	ARPC4	20,86	5	5	8	122,94	21,7	
13	P29751	Actin, cytoplasmic 1	ACTB	30,4	22	3	47	Infinity	41,73	
14	G1T346	Spectrin alpha, non-erythrocytic 1	SPTAN1	0,36	3	3	3	Infinity	289,345	
15	G1SN11	Spectrin beta chain	SPTBN1	1,71	7	7	8	Infinity	271,101	
16	G1SCY1	Synapsome associated protein 91	SNAP91	4,07	9	8	9	Infinity	92,26	
17	G1SF06	EH domain containing 3	EHD3	1,68	2	0	2	Infinity	60,9	
18	G1SLX0	Glia maturation factor beta	GMFB	6,29	1	0	1	32,49	16,79	
19	P18287	Apolipoprotein E	APOE	18,01	7	7	9	Infinity	35,48	
20	G1SR41	Stathmin	STMN1	41,89	9	0	14	Infinity	17,16	
21	G1SX46	Contactin 1	CNTN1	8,55	7	7	10	Infinity	112,67	
22	G1T7R1	Fatty acid binding protein 3	FABP3	48,87	9	8	11	Infinity	14,81	
23	G1TDK0	Myosin light chain 6	MYL6	19,87	3	3	3	Infinity	16,95	
24	G1T7S0	Myosin light chain 12B	MYL12B	11,8	2	2	2	Infinity	20,46	
25	G1TC33	Myosin heavy chain 10	MYH10	5,31	18	9	20	Infinity	228,66	
26	P58772	Tropomyosin alpha-1 chain	TPM1	10,56	5	2	5	Infinity	32,66	
27	G1T845	N-ethylmaleimide sensitive factor, vesicle fusing ATPase	NSF	5,78	4	4	5	Infinity	82,58	
28	G1TMV1	Destrin, actin depolymerizing factor	DSTN	19,39	4	4	5	Infinity	18,49	
29	G1TVI6	Collapsin response mediator protein 1	CRMP1	18,64	11	10	15	Infinity	44,59	
30	G1SER8	Profilin	PFN1	42,86	6	6	12	Infinity	10,6	
31	G1SQ87	Profilin	PFN2	26,36	3	3	7	Infinity	11,82	
32	G1TRH5	Coronin	CORO1C	8,95	7	7	7	Infinity	58,78	
33	Q9XS70	Coronin-1B	CORO1B	7,61	5	5	7	Infinity	53,58	
34	G1TED6	Annexin	ANXA5	34,27	10	10	14	Infinity	35,92	
35	P51662	Annexin A1	ANXA1	6,65	4	4	4	Infinity	38,71	
36	G1T6F6	Galectin	LGALS1	11,63	2	2	2	Infinity	18,99	
37	G1TPZ1	Galectin	LGALS1	13,43	6	6	6	Infinity	15,0	
38	G1T5Y2	Family with sequence similarity 49 member B	FAM49B	12,68	4	4	5	Infinity	38,58	
39	Q8WN94	Acyl-CoA-binding protein	DBI	20,69	2	2	4	Infinity	9,91	
40	G1U3X5	Microtubule associated protein 1B	MAP1B	8,35	22	21	31	Infinity	256,33	
41	G1T176	Microtubule-associated protein	MAPT	10,58	11	11	16	Infinity	84,50	
42	G1SNC0	Microtubule-associated protein	MAP2	11,18	27	27	33	Infinity	198,96	
43	G1TT06	Selenium binding protein 1	SELENBP1	16,53	9	9	12	Infinity	52,74	
44	G1TTD4	SID1 transmembrane family member 2	SIDT2	3,4	3	3	4	Infinity	103,52	
45	G1T9U6	Calbindin 2	CALB2	29,89	11	10	14	Infinity	31,29	
46	P19134	Serotransferrin	TF	9,35	8	7	9	Infinity	76,62	
47	G1SHX8	Versican	VCAN	0,65	4	4	5	Infinity	358,14	
48	G1SP34	Arp2/3 complex 34	ARPC2	21,33	7	7	9	Infinity	34,31	

		kDa subunit								
49	G1SFI2	Protein S100	S100B	40,22	4	4	7	Infinity	10,7	
50	G1U6H6	Four and a half LIM domains 1	FHL1	7,43	2	2	2	Infinity	33,54	
51	G1SHS7	WD repeat domain 1	WDR1	11,75	12	12	15	Infinity	65,98	
52	G1SEJ4	ATPase H+ transporting V1 subunit B2	ATP6V1 B2	3,72	3	3	3	41,782	56,367	
Proteins of signal transduction and regulation of enzyme activity										
1	G1T9B9	Neurofascin	NFASC	3,99	5	4	5	Infinity	158,626	K587
2	G1TRY5	Plastin 3	PLS3	3,17	4	4	4	38,558	70,794	
3	G1TBL6	Clathrin heavy chain	CLTC	0,95	2	2	2	18,511	216,956	
4	G1SZD6	14-3-3 protein theta	YWHAQ	53,06	17	11	43	Infinity	27,76	
5	Q6Q6X0	14-3-3 protein theta	YWHAQ	24,9	8	3	13	Infinity	27,760	
6	P62160	Calmodulin	CALM	40,94	10	10	17	Infinity	16,826	
7	G1U0V2	Alpha-synuclein	SNCA	23,57	5	2	7	Infinity	14,5	
8	G1SHQ6	Beta-synuclein	SNCB	24,63	6	3	8	Infinity	14,28	
9	G1SQC0	Cannabinoid receptor interacting protein 1	CNRIP1	26,22	5	5	6	Infinity	18,62	
10	G1TZP0	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein gamma	YWHAG	55,06	21	13	56	Infinity	28,24	
11	P62143	Serine/threonine-protein phosphatase PP1-beta catalytic subunit	PPP1CB	10,4	5	2	5	Infinity	37,16	
12	P11611	Serine/threonine-protein phosphatase 2A catalytic subunit beta isoform	PPP2CB	8,74	3	3	4	66,66	35,58	
13	B7NZQ6	Rab GDP dissociation inhibitor	GDI1	48,55	28	17	48	Infinity	50,5	
14	G1SWY0	RAB6A, member RAS oncogene family	RAB6A	14,42	3	2	6	Infinity	23,5	
15	G1SY93	Rac family small GTPase 1	RAC1	18,09	7	7	9	Infinity	22,28	
16	G1U1Q8	Macrophage migration inhibitory factor	MIF	35,65	4	4	5	Infinity	12,35	
17	B7NZM8	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein eta	YWHAH	47,15	18	11	42	Infinity	28,18	
18	G1U2B5	Pyridoxal kinase	PDXK	18,59	5	5	5	Infinity	34,83	
19	G1T7R2	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein epsilon	YWHAE	60,78	24	21	61	Infinity	29,17	
20	G1SDD6	Angiotensinogen	AGT	5,16	4	4	4	63,9	50,30	
21	P23035	Alpha-1-antitrypsin	A1AF	6,05	5	0	6	Infinity	45,84	
22	G1T432	Adenylyl cyclase-associated protein	CAP1	13,47	7	6	8	Infinity	51,59	
23	G1T3Z6	Protein kinase cAMP-dependent type II regulatory subunit beta	PRKAR2 B	14,96	7	6	8	Infinity	46,62	
24	G1SYK3	Mitogen-activated protein kinase kinase 4	MAP2K4	5,2	3	3	3	47,01	53,98	
25	G1T5Y1	Mitogen-activated protein kinase	MAPK1	30,67	10	6	13	Infinity	37,97	
26	G1T9B9	Neurofascin	NFASC	4,41	8	7	10	128,23	158,63	
27	G1TMP7	Syntaxin binding	STXBP1	37,06	21	21	35	Infinity	67,49	

		protein 1								
28	G1U0A2	Visinin like 1	VSNL1	10,99	3	3	4	60,49	22,13	
29	G1SIT9	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein beta	YWHAB	36,99	19	10	44	Infinity	28,06	
30	G1TBU8	Rap1 GTPase-GDP dissociation stimulator 1	RAP1GDS1	19,5	14	14	15	Infinity	66,19	
31	G1T4Z5	Protein tyrosine phosphatase, receptor type Z1	PTPRZ1	2,81	11	11	16	Infinity	249,70	
32	P63150	Serine/threonine-protein phosphatase 2A 55 kDa regulatory subunit B alpha isoform	PPP2R2A	10,51	5	4	7	Infinity	51,66	
33	G1TS93	Protein phosphatase 1 regulatory subunit 7	PPP1R7	11,27	8	8	10	Infinity	39,95	
34	G1SEX5	SH3 domain containing GRB2 like 2, endophilin A1	SH3GL2	11,65	7	7	9	Infinity	39,9	
35	G1T894	Bridging integrator 1	BIN1	1,73	3	3	3	34,06	62,08	
36	G1U974	Dihydropyrimidinase like 2	DPYSL2	44,93	36	32	78	Infinity	62,27	
37	G1TUH9	Dihydropyrimidinase like 3	DPYSL3	6,87	9	6	13	110,24	73,77	
38	G1U1H1	Cyclin dependent kinase 5	CDK5	5,48	2	2	2	41,24	33,27	
39	G1SDY5	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein zeta	YWHAZ	56,91	26	20	65	Infinity	27,83	
40	P29678	Dual specificity mitogen-activated protein kinase kinase 1	MAP2K1	25,19	12	12	26	Infinity	43,43	
41	P41316	Alpha-crystallin B chain	CRYAB	28,57	5	5	7	Infinity	20,09	
42	P14755	Lambda-crystallin	CRYL1	22,57	6	6	8	Infinity	35,18	
43	G1TCR0	Crystallin mu	CRYM	19,75	10	10	15	Infinity	33,59	
44	G1SIW8	Crystallin zeta	CRYZ	21,58	7	7	8	Infinity	35,22	
45	G1TM75	Pleckstrin and Sec7 domain containing 3	PSD3	2,66	4	4	4	Infinity	140,26	
46	G1TE96	LanC like 1	LANCL1	14,54	6	6	7	Infinity	45,28	
47	G1TEK2	Doublecortin like kinase 1	DCLK1	9,74	6	6	7	Infinity	81,02	
48	G1SJZ4	Obg-like ATPase 1	OLA1	8,84	4	4	5	Infinity	44,72	
49	G1TAT4	Dual specificity phosphatase 3	DUSP3	6,95	3	3	5	Infinity	20,76	
50	G1T140	Protein kinase C and casein kinase substrate in neurons 1	PACSIN1	24,1	12	12	17	Infinity	50,67	
Protective proteins										
1	G1TQP4	Heat shock protein family A (Hsp70) member 12A	HSPA12A	22,83	19	17	34	Infinity	76,84	
2	G1T1V9	Heat shock protein family A (Hsp70) member 2	HSPA2	19,21	21	4	41	111,88	69,61	
3	G1T9M9	Heat shock protein family A (Hsp70) member 8	HSPA8	43,06	42	27	83	Infinity	71,04	
4	G1U0U5	Heat shock protein family A (Hsp70) member 4 like	HSPA4L	13,66	18	14	25	Infinity	107,085	
5	G1SV05	Heat shock protein	HSPA4	18,1	17	14	24	Infinity	83,015	

		family A (Hsp70) member 4								
6	G1U7L4	Heat shock protein family A (Hsp70) member 5	HSPA5	25,65	23	19	34	Infinity	72,391	
7	G1SRF7	Heat shock protein family A (Hsp70) member 9	HSPA9	2,06	4	3	4	Infinity	73,537	
8	G1T840	Heat shock protein family H (Hsp110) member 1	HSPH1	24,45	27	21	41	Infinity	96,794	
9	G1T3Y8	Heat shock protein family D (Hsp60) member 1	HSPD1	18,73	13	13	18	Infinity	56,63	
10	P30947	Heat shock protein HSP 90-beta	HSP90A B1	38,02	44	10	102	Infinity	83,42	
11	P30946	Heat shock protein HSP 90-alpha	HSP90A A1	40,78	44	28	107	Infinity	79,68	
12	G1T8Z0	Peroxiredoxin 6	PRDX6	41,41	12	12	18	Infinity	25,233	
13	P08628	Thioredoxin	TXN	20,95	2	2	4	Infinity	11,753	
14	G1U3B8	Thioredoxin like 1	TXNL1	17,3	4	4	4	Infinity	32,243	
15	G1TAC4	Glutaredoxin-1	GLRX	10,28	1	1	2	Infinity	11,95	
16	G1TD98	Glutathione reductase	GSR	2,52	2	2	2	Infinity	51,61	
17	B6V9S9	Chaperonin containing TCP1 subunit 2	CCT2	18,13	10	10	14	Infinity	57,42	
18	P15253	Calreticulin	CALR	8,61	6	6	8	80,79	48,25	
19	G1SFE9	Aha1_N domain-containing protein	AHSA1	14,5	5	5	6	122,32	38,18	
20	G1U9R0	Glutathione S-transferase pi 1	GSTP1	55,71	12	12	28	Infinity	23,48	
21	G1TV91	Glutathione S-transferase	GSTM2	29,91	12	3	18	Infinity	26,00	
22	P11909	Glutathione peroxidase 1	GPX1	6	2	2	2	Infinity	21,87	
23	P46409	Glutathione S-transferase Mu 1	N/A	57,34	19	10	29	Infinity	25,4	
24	G1TZE2	Glutathione S-transferase zeta 1	GSTZ1	10,6	2	2	2	Infinity	24,26	
25	G1T0R9	Glutathione S-transferase	LOC100357	57,34	18	6	29	Infinity	25,48	
26	G1SXQ0	Glutathione S-transferase	GSTM3	19	9	5	12	92,15	32,75	
27	G1U9R0	GST class-pi	N/A	60,48	12	11	13	Infinity	47,393	K128
28	G1SKS9	Thioredoxin reductase 1, cytoplasmic	TXNRD1	4,88	6	6	8	Infinity	71,369	
29	G1TAF8	Stress induced phosphoprotein 1	STIP1	24,31	18	18	23	Infinity	62,5	
30	G1U9S7	T-complex protein 1 subunit alpha	TCP1	25,36	15	14	18	Infinity	60,221	
31	G1U9T8	T-complex protein 1 subunit delta	CCT4	13,28	10	9	12	Infinity	56,99	
32	G1U9T1	T-complex protein 1 subunit eta	CCT7	14	9	9	13	Infinity	59,421	
33	G1SCN8	T-complex protein 1 subunit gamma	CCT3	17,8	13	13	18	Infinity	60,550	
34	O77622	T-complex protein 1 subunit zeta	CCT6	20,9	13	13	14	Infinity	57,988	
35	G1TBC1	Endoplasmic	HSP90B 1	12,26	14	11	18	Infinity	89,259	
36	G1T1A5	Coiled-coil domain containing 30	CCDC30	1,42	1	1	1	13,117	89,330	K85 K128
37	G1THZ6	Immunoglobulin heavy constant mu	IGHM	10,83	5	1	7	Infinity	51,94	
38	G1SQ02	Peroxiredoxin 1	PRDX1	42,21	17	16	37	Infinity	22,14	
39	G1SHZ8	Chaperonin containing TCP1 subunit 8	CCT8	20,86	18	18	23	Infinity	60,62	
40	Q08863	Glutathione S-transferase alpha I		9,42	4	1	5	Infinity	25,67	

41	G1TNI4	Glutathione S-transferase	LOC100357148	41,3	15	6	21	Infinity	26,63	
42	G1TMS5	Chaperonin containing TCP1 subunit 5	CCT5	17,38	14	13	16	Infinity	59,66	
43	G1SH63	Glutathione synthetase	GSS	6,53	4	4	4	Infinity	52,18	
44	G1SZ44	10 kDa heat shock protein, mitochondrial	HSPE1	52,94	6	6	8	Infinity	10,92	
45	P62943	Peptidyl-prolyl cis-trans isomerase FKBP1A	FKBP1A	25	4	4	6	Infinity	11,94	
46	Q9TTC6	Peptidyl-prolyl cis-trans isomerase A	PPIA	46,34	13	0	29	Infinity	17,83	
47	P27124	Peptidyl-prolyl cis-trans isomerase FKBP4	FKBP4	19	10	10	12	Infinity	51,442997	
Protein regulators of gene expression, cell division, and differentiation										
1	G1U6N2	60S acidic ribosomal protein P0	N/A	2,97	1	2	3	Infinity	33,212	
2	Q0QEW4	Ribosomal protein L18 (Fragment)	RPL18	7,88	1	1	1	Infinity	18,685	
3	G1SMR7	Ribosomal protein L12	RPL12	4,62	1	1	1	32,531	21,244	
4	G1TG04	60S ribosomal protein L6	N/A	3,44	1	1	1	Infinity	32,951	
5	G1SK22	Ribosomal protein S27a	RPS27A	24,36	7	7	18	Infinity	17,953	
6	P68105	Elongation Factor 1-alpha 1	EEF1A1	11,69	5	6	6	Infinity	50,109	
7	Q71V39	Elongation factor 1-alpha 2	EEF1A2	17,49	16	2	21	Infinity	50,438	
8	P34826	Elongation factor 1-beta	EEF1B	10,67	4	4	4	Infinity	24,733	
9	P29694	Elongation factor 1-gamma	EEF1G	17,85	10	10	16	Infinity	50,107	
10	G1SS73	DEAD-box helicase 1	DDX1	3,92	7	7	11	Infinity	82,387	
11	G1SMY1	DEAD-box helicase 17	DDX17	3,69	4	4	4	Infinity	72,310	
12	G1U7I9	DEAD-box helicase 39B	DDX39B	4,98	5	5	6	Infinity	50,501	
13	G1T9T9	DEAD-box helicase 57	DHX57	0,7	1	1	1	21,986	144,702	K1150
14	G1TXI1	Nucleophosmin	NPM1	5,46	1	0	1	Infinity	26,290	
15	G1SZL5	E74 like ETS transcription factor 1	ELF1	1,05	4	4	4	Infinity	105,799	
16	G1SYN3	Leucine zipper transcription factor like 1	LZTFL1	3,68	2	2	2	Infinity	34,724	
17	G1TC61	LUC7 like 2, pre-mRNA splicing factor	LUC7L2	3,88	1	1	1	Infinity	45,516	
18	G1U194	LUC7 like 3 pre-mRNA splicing factor	LUC7L3	4,18	1	1	1	Infinity	51,336	
19	G1TPN3	Heterogeneous nuclear ribonucleoprotein A/B	HNRNP AB	13,65	4	3	6	Infinity	30,304	
20	G1TWL0	Heterogeneous nuclear ribonucleoprotein A2/B1	HNRNP A2/B1	4,53	2	0	2	Infinity	37,386	
21	O19049	Heterogeneous nuclear ribonucleoprotein K	HNRNP K	10,58	4	4	6	Infinity	50,928	
22	G1T7H0	Heterogeneous nuclear ribonucleoprotein U	HNRNP U	1,15	2	2	2	28,170	95,480	
23	G1SMM	Small nuclear	SNRPD3	7,94	1	1	2	32,507	13,907	

	7	ribonucleoprotein D3 polypeptide								
24	G1TVT0	Nucleolin	NCL	4,74	8	8	10	Infinity	83,338	
25	G1SNT1	Eukaryotic translation initiation factor 3 subunit J	EIF3J	4,25	1	1	1	Infinity	29,400	
26	G1TE76	Eukaryotic translation initiation factor 4H	EIF4H	5,26	2	2	2	Infinity	27,369	
27	P29338	Eukaryotic translation initiation factor 4E	EIF4E	6,45	1	1	2	Infinity	25,033	
28	P10160	Eukaryotic translation initiation factor 5A-1	EIF5A	12,99	2	0	4	Infinity	16,805	
29	G1SRA8	Eukaryotic translation initiation factor 2 subunit 3	EIF2S3	2,04	2	2	2	Infinity	53,459	
30	G1TE78	Proliferation and apoptosis adaptor protein 15	PEA15	51,88	6	6	10	Infinity	15,33	
31	G1T0L1	LSM3 homolog, U6 small nuclear RNA and mRNA degradation associated	LSM3	11,76	1	1	1	Infinity	11,96	
32	G1TCR0	Ketimine reductase mu-crystallin	CRYM	33,12	7	6	7	Infinity	33,614	K4 K176
33	G1SNM1	Glycyl-tRNA synthetase	GARS	8,18	8	8	12	Infinity	77,408	
34	G1SDU6	Threonyl-tRNA synthetase	TARS	2,9	3	3	4	43,579	83,417	
35	G1SW24	Alanyl-tRNA synthetase	AARS	8,58	8	8	9	Infinity	108,971	
36	G1STW7	Phenylalanyl-tRNA synthetase beta subunit	FARSB	12,26	13	13	18	Infinity	64,632	
37	G1TF82	Alanyl-tRNA synthetase domain containing 1	AARSD1	5,1	3	3	3	48,360	45,179	
38	G1SN05	RNA helicase	N/A	31,2	17	10	26	Infinity	46,37	
39	G1SUU7	tRNA-splicing ligase RtcB homolog	RTCB	7,14	5	5	6	Infinity	53,77	
40	G1SYD3	Tyrosine--tRNA ligase	YARS	7,77	5	5	6	Infinity	59,01	
41	G1SPB8	Nucleosome assembly protein 1 like 4	NAP1L4	14,29	4	3	5	Infinity	41,58	
42	G1SKT8	Transgelin 3	TAGLN3	19,21	8	7	8	Infinity	22,91	
43	G1TPN2	Cell division cycle 37	CDC37	11,44	6	6	6	Infinity	42,61	
44	G1SIV7	Asparaginyl-tRNA synthetase	NARS	2,19	1	1	1	23,617	63,324	
45	G1T846	Aspartyl-tRNA synthetase	DARS	2,99	3	3	3	Infinity	57,220	
46	G1SLD6	Histidyl-tRNA synthetase	HARS	6,09	5	5	5	Infinity	57,435	
47	G1T214	Glutamyl-prolyl-tRNA synthetase	EPRS	2,12	4	4	4	Infinity	170,236	

Table 3a. Proteins associated with rabbit liver 26S proteasomes

No	Accession (Uniprot)	Protein name (Uniprot)	Gene	Coverage	Peptides	Unique peptides	PSMs	Score	MW (kDa)	Ubiquitination
Other UPS components										
1	P62975	Ubiquitin	N/A	32,89	2	2	2	Infinity	8,56	
2	G1THY3	Ubiquitin conjugating enzyme E2 V1	UBE2V1	6,76	1	1	1	25,477	16,64	
3	Q29504	Ubiquitin-like modifier-activating	UBA1	2,55	5	5	6	Infinity	117,61	

		enzyme 1								
4	G1SK00	Ubiquitinyl hydrolase 1	USP5	9,45	8	8	9	Infinity	96,31	
5	G1SMJ5	Ubiquitin-fold modifier 1	N/A	17,65	1	1	1	Infinity	9,17	
6	G1U7C7	HECT and RLD domain containing E3 ubiquitin protein ligase 4	HERC4	2,36	5	5	5	50,103	113,88	
7	G1TEW4	Ubiquitin specific peptidase 9, X-linked	USP9X	1,32	5	5	5	88,1	292,13	
8	G1SKM5	NPL4 homolog, ubiquitin recognition factor	NPLOC4	6,25	3	3	3	59,93	67,98	
9	G1TSL5	Ubiquitin recognition factor in ER associated degradation 1	UFD1	8,79	3	3	3	37,805	34,47	
10	G1T107	UBC core domain-containing protein	UBE2N	20,42	3	0	3	70,68	15,99	
Metabolic enzymes										
1	P36512	UDP-glucuronosyltransferase 2B13	UGT2B13	3,77	2	0	3	Infinity	60,51	
2	G1SP48	UDP-glucose 6-dehydrogenase	UGDH	9,75	6	6	7	Infinity	53,62	
3	P07511	Serine hydroxymethyltransferase, cytosolic	SHMT1	12,4	7	7	9	Infinity	52,94	
5	G1ST24	Acetyl-CoA carboxylase beta	ACACB	3,44	18	18	19	164,61	277,14	
6	G1TF44	Asparaginase	ASPG	19,83	10	10	16	Infinity	51,49	
7	G1SVB6	Glutamate dehydrogenase	GLUD1	12,22	8	6	11	Infinity	49,49	
8	P13491	L-lactate dehydrogenase A chain	LDHA	14,76	8	7	9	Infinity	36,54	
9	G1SVH0	Adenosylhomocysteinase	AHCY	23,32	14	14	25	Infinity	58,47	
10	G1T8B6	Phe-4-monooxygenase	PAH	39,06	25	25	50	Infinity	53,49	
11	G1SFD2	Thymidine phosphorylase	TYMP	10,42	5	5	6	82,82	44,52	
12	G1SWF2	Argininosuccinate synthase 1	ASS1	16,5	11	11	14	Infinity	46,76	
13	G1T060	Hydroxysteroid 17-beta dehydrogenase 4	HSD17B4	40,76	35	35	67	Infinity	79,68	
14	G1T8G9	Pyruvate kinase	PKLR	39,9	22	3	38	Infinity	63,52	
15	G1SFF7	Amine oxidase	MAOB	12,88	9	9	10	Infinity	58,60	
16	P79226	Fructose-bisphosphate aldolase B	ALDOB	29,12	11	10	16	Infinity	39,58	
17	G1U4D2	Methyltransferase like 7B	METTL7B	19,67	5	5	6	Infinity	27,83	
18	G1TK53	N-acyl-L-amino-acid amidohydrolase	ACY1	9,3	7	7	8	120,67	53,51	
19	G1SXS4	Bile acid-CoA:amino acid N-acyltransferase	BAAT	25,06	14	14	20	Infinity	43,16	
20	Q95KM0	Arginase-1	ARG1	9,63	4	4	5	71,99	34,43	
21	G1T465	3alpha(17beta)-hydroxysteroid dehydrogenase	PGER	13,62	7	0	12	49,91	36,62	
22	G1SGJ4	Serine racemase	SRR	8,13	3	3	5	Infinity	57,51	
23	Q03505	Alcohol dehydrogenase 1	ADH1	37,03	18	17	31	Infinity	39,56	K20 K1
24	G1T8P1	10-formyltetrahydrofolate dehydrogenase	ALDH1L1	61,36	100	91	273	Infinity	105,92	K889 K1
25	G1SUY2	Aldehyd domain-containing protein	ALDH2	12,65	12	10	17	Infinity	54,43	
26	P80456	Aldehyde oxidase 1	AOX1	20,99	39	3	52	67,01	147,04	

27	G1T6W7	Catalase	CAT	30,55	18	18	20	Infinity	59,62	
28	G1SHI0	Acetyl-CoA acyltransferase 1	ACAA1	17,81	8	8	10	Infinity	43,58	
29	G1T678	Acetyl-CoA acetyltransferase 2	ACAT2	24,38	11	1	20	Infinity	41,33	
30	G1TKQ5	Pterin-4 alpha-carbinolamine dehydratase 1	PCBD1	55,77	10	10	19	Infinity	11,99	
31	P12337	Liver carboxylesterase 1		18,76	15	15	16	Infinity	62,25	
32	G1TTJ1	Dehydrogenase/reductase 11	DHRS11	17,37	5	5	6	Infinity	28,16	
33	G1T8Y0	Coenzyme A synthase	COASY	10,07	5	5	7	101,88	63,02	
34	G1SFZ6	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 1	PFKFB1	14,16	10	6	10	81,82	54,68	
35	G1TAA6	3-hydroxyanthranilate 3,4-dioxygenase	HAAO	15,38	8	8	9	Infinity	36,79	
36	G1SWV6	Argininosuccinate lyase	N/A	36,31	33	33	58	Infinity	70,72	
37	G1SF05	D-aspartate oxidase	DDO	21,13	8	8	9	120,07	37,41	
38	G1SW00	Glutamate-ammonia ligase	GLUL	26,73	13	13	19	Infinity	37,45	
39	G1SEP0	Beta-carotene oxygenase 1	BCO1	4,06	5	5	5	62,17	61,40	
40	G1T7R2	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein epsilon	YWHAE	28,24	9	7	13	141,42	29,17	
41	P46406	Glyceraldehyde-3-phosphate dehydrogenase	GAPDH	6,91	6	6	7	Infinity	35,75	
42	G1TFX3	5-hydroxyisourate hydrolase		52,54	4	4	7	Infinity	13,42	
43	G1STY0	Glycerate kinase	GLYCK	13,58	8	8	9	Infinity	54,99	
44	Q9GKX2	Dehydrogenase/reductase SDR family member 4 (Fragment)	DHRS4	5	1	0	1	Infinity	27,42	
45	G1U6B2	Delta-aminolevulinic acid dehydratase	ALAD	36,36	11	11	17	Infinity	36,06	K252 K1
46	G1T1V5	Carbonic anhydrase 3	CA3	24,16	10	0	15	Infinity	30,35	
47	G1T6C1	Deoxyribose-phosphate aldolase	DERA	10,06	3	3	3	51,96	35,11	
48	P17636	Dimethylaniline monooxygenase [N-oxide-forming] 1	FMO1	8,79	6	6	7	Infinity	60,14	
49	P31030	Serine--pyruvate aminotransferase	AGXT	27,04	13	13	22	Infinity	43,12	
50	G1U0Z4	Agmatinase	AGMAT	16,19	8	8	13	Infinity	37,69	
51	G1T6I0	Aldehyde oxidase 1	AOX1	24,21	40	4	55	Infinity	136,06	
52	G1SS41	Acyl-CoA dehydrogenase very long chain	ACADVL	4,31	3	3	3	Infinity	73,94	
53	G1TVX2	Acyl-CoA dehydrogenase family member 11	ACAD11	20,46	15	15	25	Infinity	86,82	
54	G1SM91	Fumarylacetoacetate hydrolase	FAH	18,31	7	7	10	Infinity	45,99	
55	G1T704	Sorbitol dehydrogenase	SORD	22,28	8	8	17	Infinity	38,14	
56	Q9TV64	3-oxo-5-beta-steroid 4-dehydrogenase	AKR1D1	18,71	14	1	22	Infinity	37,47	
57	G1SSL9	Hydroxysteroid 17-beta dehydrogenase 13	HSD17B13	24	9	7	12	Infinity	33,27	
58	G1TEA7	Carbamoyl-phosphate synthase 1	CPS1	14,32	26	26	36	Infinity	165,44	
59	G1SUR4	Zinc binding alcohol dehydrogenase domain containing 2	ZADH2	21,75	9	9	16	Infinity	39,75	
60	G1SSW1	1-aminocyclopropane-1-carboxylate synthase	ACCS	5,1	3	3	4	Infinity	57,31	

		homolog (inactive)								
61	G1T4Z2	ATP-citrate synthase	ACLY	8,63	15	15	17	Infinity	119,26	
62	G1SKJ7	Glycine N-methyltransferase	GNMT	36,61	11	11	19	Infinity	32,84	
63	P00939	Triosephosphate isomerase	TPI1	4,84	5	5	5	Infinity	26,61	
64	G1SYE0	Abhydrolase domain containing 14B	ABHD14B	43,33	7	7	9	Infinity	22,41	
65	G1T1U7	Methylenetetrahydrofolate dehydrogenase, cyclohydrolase and formyltetrahydrofolate synthetase 1	MTHFD1	8,02	13	13	14	Infinity	101,19	
66	G1T2T5	Enoyl-CoA hydratase and 3-hydroxyacyl CoA dehydrogenase	EHHADH	35,95	29	29	50	Infinity	61,18	
67	G1T347	Serine dehydratase like	SDSL	7,88	3	3	4	Infinity	34,56	
68	O46650	Alcohol dehydrogenase class-2 isozyme 2	ADH2-2	38,52	17	13	28	Infinity	40,47	
69	G1SYJ4	Enolase 1	ENO1	6,22	5	0	5	Infinity	47,24	
70	G1SL41	Beta-glucuronidase	GUSB	9,61	7	7	7	Infinity	73,86	
71	G1STM6_	Nicotinate-nucleotide pyrophosphorylase [carboxylating]	QPRT	42,14	11	11	20	Infinity	31,04	
72	G1U8R2	2-iminobutanoate/2-iminopropanoate deaminase	N/A	17,52	4	4	5	56,72	14,46	
73	G1SMY7	Acylamino-acid-releasing enzyme	APEH	16.08.21	11	11	15	Infinity	81,15	
74	G1T4D2	Acyl-coenzyme A oxidase	ACOX1	12,48	15	15	17	Infinity	70,37	
75	G1SK42	Transglutaminase 2	TGM2	16,73	15	15	24	Infinity	82,49	
76	G1TE35	Nudix hydrolase 12	NUDT12	9,66	5	5	5	107,27	53,29	
77	G1SPL1	D-3-phosphoglycerate dehydrogenase	PHGDH	20,45	15	15	21	Infinity	56,43	
78	G1TX10	Peptidylprolyl isomerase	FKBP11	9,22	4	0	9	51,26	40,17	
79	P11645	Uricase	UOX	12,67	7	7	8	109,75	34,48	
80	G1SQ01	Aldo-keto reductase family 1 member A1	AKR1A1	21,5	11	11	16	Infinity	47,05	
81	G1SPL7	3-hydroxy-3-methylglutaryl coenzyme A synthase	HGMCS2	8,66	5	5	6	Infinity	56,8	
82	G1T218	4-hydroxyphenylpyruvate dioxygenase	HPD	22,39	10	10	14	Infinity	44,8	
83	G1SPY1	1,4-alpha-glucan branching enzyme 1	GBE1	24,09	16	16	20	Infinity	81,27	
84	G1SEA8	Gephyrin	GPHN	11,9	6	6	8	Infinity	70,03	
85	P00187	Cytochrome P450 1A2	CYP1A2	19,77	13	9	16	Infinity	58,3	
86	P00179	Cytochrome P450 2C5	CYP2C5	7,19	9	7	12	70,49	55,24	
87	P00169	Cytochrome b5	CYB5A	47,76	6	6	12	Infinity	15,34	
88	P00511	ATP-dependent 6-phosphofructokinase, muscle type	PFKM	1,15	2	2	3	Infinity	85,14	
89	P00883	Fructose-bisphosphate aldolase A	ALDOA	3,57	2	1	2	Infinity	39,32	
90	P00563	Creatine kinase M-type	CKM	8,92	3	3	3	Infinity	43,08	
91	P00637	Fructose-1,6-bisphosphatase 1	FBP1	9,47	2	3	3	Infinity	36,55	
Components of cytoskeleton and transport proteins										
1	G1TDK0	Myosin light chain 6	MYL6	28,48	5	5	7	Infinity	16,95	

2	G1T7S0	Myosin light chain 12B	MYL12B	28,65	5	5	6	Infinity	20,46	
3	G1SL68	Myosin heavy chain 9	MYH9	13,17	31	23	38	Infinity	226,26	
4	P29751	Actin, cytoplasmic 1	ACTB	36,53	19	4	44	Infinity	41,73	
5	G1TQR0	Actinin alpha 1	ACTN1	19,84	25	7	41	92,31	102,95	
6	G1TUC8	Actinin alpha 4	ACTN4	46,26	50	30	84	Infinity	87,39	
7	G1SW48	Shootin 1	SHTN1	10,46	9	9	10	Infinity	68,57	
8	G1SER8	Profilin	PFN1	56,12	6	6	13	Infinity	10,60	
9	G1TCY4	Sorting nexin	SNX5	13,86	5	5	8	Infinity	46,75	
10	G1T5E6	Sorting nexin 2	SNX2	122,72	7	6	7	Infinity	58,38	
11	B7NZG7	Sorting nexin 3 (Predicted)	SNX3	11,73	2	2	2	41,21	18,75	
12	G1T9I4	Sorcin	SRI	10,61	6	6	7	Infinity	21,61	
13	G1SL10	Tubulin alpha chain	N/A	29,05	18	0	53	Infinity	50,15	
14	G1SH05	Tubulin beta chain	TUBB	52,25	32	5	66	Infinity	49,69	
15	G1T8D4	SEC31 homolog A, COPII coat complex component	SEC31A	14,03	23	23	32	Infinity	133,99	
16	G1T0Y9	Dynactin subunit 2	DCTN2	6,72	4	4	4	59,38	44,21	
17	G1SZR7	Kinectin 1	KTN1	0,9	4	4	4	50,15	153,87	
18	G1SJ56	Vinculin	VCL	18,87	28	28	34	Infinity	123,73	
19	G1T7T6	General vesicular transport factor p115	USO1	6,46	6	7	7	Infinity	107,22	K904
20	G1U9I8	Cytokeratin-1	KRT1	13,75	13	9	26	Infinity	64,19	K430 K1
21	Q29426	Keratin, type II cytoskeletal 3	KRT3	1,43	1	1	1	21,553	64,30	K400 K1
22	G1SL02	AP complex subunit beta	AP2B1	10,94	19	0	23	109,07	105,61	
23	G1U0Q7	Septin 2	SEPT2	17,17	6	5	8	Infinity	41,46	
24	G1SF47	Septin 11	SEPT11	16,35	7	6	10	Infinity	53,99	
25	G1SQR6	Calponin	CNN3	6,38	5	5	6	Infinity	36,32	
26	G1SZE0	Vacuolar protein sorting-associated protein 35	VPS35	9,05	9	9	10	Infinity	91,63	
27	G1TR82	Tubulin alpha chain	TUBA2A	43,53	24	4	51	Infinity	49,89	
28	G1U4I0	Tubulin beta chain	TUBB4A	40,54	32	6	63	Infinity	49,55	
29	G1SYV9	Talin 1	TLN1	10,47	35	29	36	Infinity	270,52	
30	P09809	Apolipoprotein A-I	APOA1	31,95	8	0	11	Infinity	30,57	
31	B7NZM0	Apolipoprotein A-IV (Predicted)	APOA4	16,92	8	8	9	152,6	44,14	
32	G1U2V8	Apolipoprotein C3	APOC3	26,67	3	3	3	Infinity	11,29	
33	P18287	Apolipoprotein E	APOE	17,36	5	5	7	108,83	35,48	
34	G1SNT8	Annexin	ANXA6	1,27	5	5	6	49,27	88,72	
35	P62493	Ras-related protein Rab-11A	RAB11A	5,09	2	2	2	30,46	24,38	
36	G1SCD7	TPR_REGION domain-containing protein	N/A	13,55	6	0	7	Infinity	41,27	
37	G1T346	Spectrin alpha, non-	SPTAN1	21,71	70	70	88	Infinity	289,35	

		erythrocytic 1								
38	G1SN11	Spectrin beta chain	SPTBN1	15,28	42	40	48	Infinity	271,10	
39	G1SUS6	Secretion associated Ras related GTPase 1B	SAR1B	27,27	6	3	8	Infinity	22,42	
40	G1TW43	Tenascin C	TNC	0,42	3	3	3	26,47	260,86	
41	G1T7I4	Coatomer subunit alpha	COPA	6,37	13	13	15	Infinity	138,30	
42	G1SDA4	Coatomer subunit beta	COPB1	7,87	9	9	13	Infinity	106,97	
43	G1SQ22	Coatomer subunit gamma	COPG1	11,44	12	12	13	Infinity	97,66	
44	G1SYQ5	Coatomer subunit delta	ARCNI	8,22	6	0	6	105,13	57,15	
45	G1SMX4	Diaphanous related formin 1	DIAPH1	1,05	2	2	2	26,27	137,20	
46	G1SY70	Protein transport protein SEC23	SEC23A	16,86	13	13	16	Infinity	86,14	
47	G1SCI0	Dynein cytoplasmic 1 heavy chain 1	DYNC1 H1	4,01	21	21	21	Infinity	378,28	
48	G1SXE6	Dynein cytoplasmic 1 light intermediate chain 1	DYNCIL I1	5,19	3	3	4	Infinity	56,18	
49	G1SKL7	Vesicle amine transport 1	VAT1	4,46	3	3	3	45,03	42,85	
50	G1U8F0	AP-2 complex subunit alpha	AP2A1	2,31	5	5	5	Infinity	104,91	
51	G1TKE3	Transgelin	TAGLN2	23,2	6	6	6	102,4	21,42	
52	G1TBL6	Clathrin heavy chain	CTLC	20,09	43	32	71	Infinity	216,96	
53	G1SR03	Valosin containing protein	VCP	36,48	48	48	74	Infinity	89,27	
54	G1TZQ5	SEC24 homolog C, COPII coat complex component	SEC24C	3,14	5	5	5	Infinity	109,48	
55	G1TRH3	Cathepsin Z	GTSZ	7,21	2	2	2	Infinity	34,06	
56	G1SYD6	Lamin A/C	LMNA	11,76	10	0	12	Infinity	74,02	
57	G1SE61	Filamin-B	FLNB	21,41	60	54	74	Infinity	277,83	
58	G1SWS9	Vimentin	VIM	15,45	12	9	12	Infinity	53,62	
59	G1TDU0	Kinesin-like protein	KIF5B	5,52	7	6	7	Infinity	99,07	
60	O62742	Non-specific lipid-transfer protein	SCP2	27,42	18	18	24	Infinity	58,87	
61	G1T3V0	High density lipoprotein binding protein	HDLBP	3,23	7	7	8	120,12	141,53	
62	G1SF06	EH domain containing 3	EHD3	7,46	5	0	6	39,08	60,90	
63	G1U8T9	Potassium channel tetramerization domain containing 12	KCTD12	11,17	3	3	3	Infinity	40,96	

Proteins of signal transduction and regulation of enzyme activity										
1	G1TI71	UTP--glucose-1-phosphate uridylyltransferase	UGP2	30,1	16	16	25	Infinity	57,44	
2	G1T5T8	PDZ and LIM domain 1	PDLIM1	14,55	5	5	5	114,89	36,10	
3	Q8MI17	Retinal dehydrogenase 1	ALDH1A1	35,48	22	2	45	Infinity	54,31	
4	G1SEK8	Fetuin B	FETUB	11,99	5	5	8	Infinity	42,91	
5	G1SV35	Protein kinase AMP-activated non-catalytic subunit gamma 1	PRKAG1	3,03	4	4	4	Infinity	37,33	
6	G1SPJ5	GCN1, eIF2 alpha kinase activator homolog	GCN1	0,9	7	7	7	62,84	292,41	
7	Q9TTJ6	Regucalcin	RGN_	16,39	5	5	5	Infinity	33,09	
8	G1TC46	S-adenosylmethionine synthase	MAT1A	29,82	15	15	42	Infinity	43,92	
9	G1TKE7	IQ motif containing GTPase activating protein 2	IQGAP2	18,46	34	33	42	Infinity	179,97	
10	G1TT75	Progesterone receptor membrane component 1	PGRMC1	34,18	7	7	9	Infinity	21,83	
11	P80508	Prostaglandin-E(2) 9-reductase	AKR1C5	21,67	10	1	19	Infinity	36,65	
12	G1U416	Asialoglycoprotein receptor 1	ASGR1	8,1	3	3	6	Infinity	31,99	
13	D5LXX2	TGF-beta receptor type-2	N/A	1,94	1	1	1	Infinity	64,48	K52 K1
14	G1TB18_	Rho GTPase activating protein 1	ARHGAP1	6,14	3	3	3	58,31	50,82	
15	G1SCP7	IQ motif containing GTPase activating protein 1	IQGAP1	0	3	0	3	32,89	189,19	
16	P62160	Calmodulin	CALM	11,41	2	2	2	Infinity	16,82	
Protective proteins										
1	G1U974	Dihydropyrimidinase like 2	DPYSL2	7,17	5	4	6	57,16	62,27	
2	G1T3Y8	Heat shock protein family D (Hsp60) member 1	YSPD1	16,48	10	10	12	Infinity	56,63	
3	G1T3V2	Heat shock 27 kDa protein	HSPB1	64,71	23	23	50	Infinity	22,59	
4	P30946	Heat shock protein HSP 90-alpha	HSP90A	16,71	14	8	18	Infinity	79,68	

			A1							
5	G1U7L4	Heat shock protein family A (Hsp70) member 5	HSPA5	14,96	12	9	16	Infinity	72,39	
6	G1T9M9	Heat shock protein family A (Hsp70) member 8	HSPA8	24,38	19	15	38	Infinity	71,04	
7	G1SRF7	Heat shock protein family A (Hsp70) member 9	HSPA9	5,45	7	7	7	100,16	73,54	
8	Q95KM3	Sulfotransferase	N/A	33,22	9	9	11	Infinity	34,19	K206 K1
9	G1SST9	UV excision repair protein RAD23	RAD23B	16,38	11	11	12	Infinity	43,25	
10	P11909	Glutathione peroxidase 1	GPX1	27	6	2	8	Infinity	21,87	
11	G1SPZ7	Glutathione peroxidase	GPX1	44,14	8	4	10	78,81	16,17	
12	G1T4A7	Glutathione transferase	N/A	27,63	9	5	20	Infinity	29,29	
13	Q08863	Glutathione S-transferase alpha I		43<5	10	6	19	Infinity	25,67	
14	Q08862	Glutathione S-transferase Yc		49,32	11	8	29	Infinity	25,43	
15	G1SVP7	Glutathione S-transferase omega 1	GSTO1	13,28	5	5	8	Infinity	27,63	
16	P46409	Glutathione S-transferase Mu 1	N/A	29,82	8	1	9	Infinity	25,40	
17	G1TZE2	Glutathione S-transferase zeta 1	GSTZ1	37,33	13	13	16	Infinity	24,26	
18	P21195	Protein disulfide-isomerase	P4HB	3,54	4	4	4	48,33	56,77	
19	G1T4H3	Protein disulfide isomerase family A member 6	PDIA6	9,55	6	6	7	97,79	47,97	
20	G1SMM6	Betaine--homocysteine S-methyltransferase	BHMT	27,97	12	12	16	Infinity	44,3	
21	G1T6I6	Interleukin enhancer binding factor 3	ILF3	1,33	4	4	4	35,28	95,82	
22	G1T2C3	Cold shock domain containing E1	CSDE1	1,3	3	0	3	42,33	93,67	
23	G1SQ02	Peroxiredoxin 1	PRDX1	39,7	11	10	15	Infinity	22,14	
24	G1T8Z0	Peroxiredoxin 6	PRDX6	33,92	9	9	11	Infinity	25,23	
25	P08628	Thioredoxin	TXN	12,38	1	1	2	Infinity	11,75	
26	G1TDH4	Thioredoxin domain-containing protein	PRDX3	23,23	9	9	18	Infinity	27,48	
27	G1T932	Peroxisomal sarcosine oxidase	PIPOX	30,51	11	10	18	Infinity	43,71	
28	G1SNX5	Interleukin enhancer binding factor 2	ILF2	8,6	3	3	3	64,08	44,87	

29	G1SQF9	Paraspeckle component 1	PSPC1	6,51	5	5	5	59,02	58,59	
30	G1SHZ8	Chaperonin containing TCP1 subunit 8	CCT8	4,32	3	3	3	51,05	60,62	
31	G1TQK5	Calcium regulated heat stable protein 1	CARHSP 1	10,81	1	1	2	Infinity	15,48	
32	G1THZ6	Immunoglobulin heavy constant mu	IGHM	18,75	15	4	31	Infinity	51,94	
33	P01832	Polymeric immunoglobulin receptor	PIGR	12,42	11	11	15	Infinity	83,83	
34	G1TEG8	Programmed cell death 6 interacting protein	PDCD6I P	6,06	9	9	10	Infinity	99,47	
35	P27124	Peptidyl-prolyl cis-trans isomerase FKBP4	FKBP4	4,8	3	3	3	Infinity	51,44	
Protein regulators of gene expression, cell division, and differentiation										
1	G1TZE5	Chromosome 1 open reading frame 50	C1orf50	8,04	2	2	2	Infinity	21,87	
2	G1SGC0	Gasdermin D	GSDMD	8,28	5	5	5	Infinity	50,88	
3	G1T1K7	APOBEC1 complementation factor	A1CF	5,61	5	5	5	85,69	64,39	
4	G1SMM7	Small nuclear ribonucleoprotein D3 polypeptide	SNRPD3	7,94	2	2	2	28,18	13,91	
5	G1U448	Far upstream element binding protein 1	FUBP1	3,8	5	4	5	Infinity	69,48	
6	G1SNZ3	Chromosome segregation 1 like	CSE1L	0,93	5	5	6	45,1	110,37	
7	P68105	Elongation factor 1-alpha 1	EEF1A1	30,3	22	0	60	Infinity	50,11	
8	P34826	Elongation factor 1-beta	EEF1B	16,44	3	3	7	Infinity	24,73	
9	P29694	Elongation factor 1-gamma	EEF1G	16,02	9	9	11	Infinity	50,02	
10	P53787	Elongation factor 1-delta	EEF1D	23,57	5	5	7	Infinity	31,06	
11	G1TWL0	Heterogeneous nuclear ribonucleoprotein A2/B1	HNRNP A2/B1	33,14	13	10	18	Infinity	37,39	
12	O77768	Heterogeneous nuclear ribonucleoprotein C	HNRNP C	9,48	5	5	6	Infinity	33,66	
13	G1SLT8	Heterogeneous nuclear	HNRNP H3	2,89	1	1	1	Infinity	36,90	

		ribonucleoprotein H3								
14	O19049	Heterogeneous nuclear ribonucleoprotein K	HNRNP K	23,54	17	11	29	Infinity	50,93	
15	G1SIP2	Heterogeneous nuclear ribonucleoprotein L	HNRNP L	3,58	3	3	4	Infinity	64,02	
16	G1T7H0	Heterogeneous nuclear ribonucleoprotein U	HNRNP U	5,97	7	7	10	110,78	95,48	
17	O19048	Poly(rC)-binding protein 1	PCBP1	15,73	10	6	11	Infinity	37,47	
18	G1U603	DNA damage inducible 1 homolog 2	DDI2	10,92	5	5	5	Infinity	38,61	
19	G1SII3	DNA nucleotidylexotransferase	DNTT	2,03	1	3	3	19,511	56,69	K191 K1
20	G1T430	SET domain bifurcated histone lysine methyltransferase 1	SETDB1	1,16	1	2	2	Infinity	142,70	K788 K1
21	G1SMY1	DEAD-box helicase 17	DDX17	7,23	9	8	10	Infinity	72,31	
22	G1SLM0	Polyadenylate-binding protein	PABPC1	7,7	10	0	12	89,89	70,60	
23	G1SGB5	Splicing factor proline and glutamine rich	SFPQ	9,06	4	4	4	Infinity	57,33	
24	G1T9F3	Karyopherin subunit beta 1	KPNB1	7,53	8	8	9	Infinity	97,14	
25	G1T0H3	Signal transducer and activator of transcription	STAT3	12,47	10	10	11	154,2	88,12	
26	G1SHL8	Signal transducer and activator of transcription	STAT1	11,64	11	11	14	Infinity	88,12	
27	G1TWP4	Valyl-tRNA synthetase	VAR5	7,47	9	9	9	Infinity	139,09	
28	G1SN68	Glutamyl-tRNA synthetase	QARS	2,71	5	5	5	54,32	87,32	
29	G1TKC4	Lysyl-tRNA synthetase	KARS	2,39	2	2	2	Infinity	61,98	
30	G1T846	Aspartyl-tRNA synthetase	DARS	2,99	4	4	4	40,77	57,22	
31	G1T2I4	Glutamyl-prolyl-tRNA synthetase	EPRS	4,49	7	7	7	Infinity	170,24	
32	G1T3Z2	NSFL1 cofactor	NSFL1C	20,22	9	9	10	Infinity	40,62	
33	G1SDS3	NDRG family member 2	NRDG2	28,84	10	10	12	Infinity	40,69	
34	G1SE57	ADP ribosylation factor 4	ARF4	21,67	3	2	6	Infinity	20,50	

Table 4a. Proteins associated with rabbit liver 20S proteasomes

Nº	Accessio	Protein name	Gene	Coverage	Peptides	Unique	PSMs	Score	MW	Ubiquit
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	n (Uniprot)	(Uniprot)				peptide s			(kDa)	ination
Other UPS components										
1	P62975	Ubiquitin	N/A	11,84	2	3	5	Infinit y	8,565	
2	Q29504	Ubiquitin-like modifier-activating enzyme 1	UBA1	6,71	11	11	17	Infinit y	117,688	
3	G1SMJ5	Ubiquitin-fold modifier 1	N/A	17,65	1	2	2	Infinit y	9,164	
4	G1THY3	Ubiquitin conjugating enzyme E2 V1	UBE2V1	6,76	2	1	2	Infinit y	16,644	
5	G1SPV0	Ubiquitin conjugating enzyme E2 K	UBE2K	11	2	2	2	Infinit y	22,392	
6	P40826	Ubiquitin carboxyl-terminal hydrolase 14	USP14	2,64	1	2	2	23,990	55,886	
7	G1T107	UBC core domain-containing protein	UBE2N	7,75	3	0	3	Infinit y	15,99	
8	G1U8C4	Proteasome activator subunit 1	PSME1	15,26	4	4	4	Infinit y	28,64	
Metabolic enzymes										
1	G1T7Z0	6-phosphogluconate dehydrogenase, decarboxylating	PGD	6,99	5	5	6	Infinit y	69,89	
2	G1SNJ7	Alanine--glyoxylate aminotransferase 2	AGXT2	6	5	5	6	Infinit y	57,42	
3	G1SPL7	3-hydroxy-3-methylglutaryl coenzyme A synthase	HMGCS2	24,21	17	15	24	Infinit y	56,8	
4	G1T1M5	Aldehyde dehydrogenase 8 family member A1	ALDH8A1	9,86	7	7	9	Infinit y	53,36	
5	G1SQ01	Aldo-keto reductase family 1 member A1	AKP1A1	24,53	14	13	19	Infinit y	47,05	
6	G1T218	4-hydroxyphenylpyruvate dioxygenase	HPD	51,65	40	40	74	Infinit y	44,8	
7	G1T8H3	Galactokinase 1	GALK1	10,5	9	9	9	Infinit y	42,84	
8	P79226	Fructose-bisphosphate aldolase B	ALDOB	54,95	43	43	108	Infinit y	39,58	
9	G1SFJ8_	Fatty acid binding protein 7	FABP7	40,91	8	8	11	Infinit y	14,93	
10	Q03505	Alcohol dehydrogenase 1	ADH1	77,33	60	53	189	Infinit y	39,56	K20 K1 K136 K2
11	G1TAA6	3-hydroxyanthranilate 3,4-dioxygenase	HAAO	22,15	13	13	16	Infinit y	36,79	
12	G1SWP5	Aldo_ket_red domain-containing protein	N/A	32,28	18	9	30	Infinit y	32,37	
13	G1SFP0	Leucine aminopeptidase 3	LAP3	17,53	11	11	11	Infinit y	56,25	K489 K1
14	G1T970	Aldehyde dehydrogenase 4 family member A1	ALDH4A1	12,13	8	8	9	Infinit y	66,43	
15	G1TAH7	Transketolase	TKT	27,13	19	19	24	Infinit y	67,66	
16	G1SNH7	Dihydropteridine reductase	QDPR	33,2	8	8	16	Infinit y	25,94	
17	G1TCW5	Peptidase D	PEPD	1,83	2	2	2	Infinit y	54,63	
18	G1SIF2	Phosphoenolpyruvate carboxykinase 2, mitochondrial	PCK2	11,25	11	11	15	Infinit y	70,57	
19	O46650	Alcohol dehydrogenase class-2 isozyme 2	ADH2-2	47,23	40	31	72	Infinit y	40,47	K20 K1
20	G1T386	Guanine deaminase	GDA	7,27	4	4	6	Infinit y	51,1	
21	G1SUY2	Aldedh domain-containing protein	ALDH2	11,24	11	7	27	Infinit y	54,43	
22	P00637	Fructose-1,6-bisphosphatase 1	FBP1	39,64	19	19	28	Infinit y	36,55	

23	G1T2T5	Enoyl-CoA hydratase and 3-hydroxyacyl CoA dehydrogenase	EHHADH	2,62	2	2	2	Infinit y	61,18	
24	G1SVL7	Ketohexokinase	KHK	19,13	5	5	5	Infinit y	32,64	
25	G1T090	Dipeptidyl peptidase 3	DPP3	3,52	5	5	6	44,84	82,64	
26	G1SVB6	Glutamate dehydrogenase	GLUD1	10,89	6	6	7	Infinit y	49,49	
27	G1U2R2	Aminopeptidase	NPEPPS	4,67	5	5	5	Infinit y	103,36	
28	G1SNP9	Acyl-CoA dehydrogenase short/branched chain	ACADS B	14,97	6	6	10	Infinit y	52,09	
29	G1SWF2	Argininosuccinate synthase 1	ASS1	32,28	23	23	51	Infinit y	46,76	
30	G1T060	Hydroxysteroid 17-beta dehydrogenase 4	HSD17B 4	1,77	3	3	3	Infinit y	79,68	
31	G1T8B6	Phenylalanine hydroxylase	PAH	15,02	9	9	10	Infinit y	53,46	
32	P13491	L-lactate dehydrogenase A chain	LDHA	52,41	27	22	51	Infinit y	36,54	
33	G1SWC0	Homogentisate 1,2-dioxygenase	HGD	11,77	18	18	30	Infinit y	74,81	
34	Q8MI17	Retinal dehydrogenase 1	ALDH1 A1	56,65	80	74	214	Infinit y	54,31	
35	G1SDD0	Enoyl-CoA hydratase, short chain 1	ECHS1	16,21	7	7	10	Infinit y	31,25	
36	P31030	Serine--pyruvate aminotransferase	AGXT	22,19	13	13	24	Infinit y	43,12	
37	G1T6G8	Dimethylglycine dehydrogenase	DMGDH	8,07	10	10	13	Infinit y	89,77	K636, K648, K2
38	P10658	Phosphoserine aminotransferase	PSAT1	17,03	12	12	15	Infinit y	40,59	
39	G1SM91	Fumarylacetoacetate hydrolase	FAH	36,14	16	16	26	Infinit y	45,99	
40	P00939	Triosephosphate isomerase	TPI1	15,32	4	4	5	Infinit y	26,61	
41	G1U6B2	Delta-aminolevulinic acid dehydratase	ALAD	13,94	5	5	7	Infinit y	36,06	K252 K1
42	G1SHI0	Acetyl-CoA acyltransferase 1	ACAA1	20,19	8	8	14	Infinit y	43,58	K56 K1
43	G1SYE0	Abhydrolase domain containing 14B	ABHD1 4B	43,33	14	14	20	Infinit y	22,41	
44	G1TBU9	Acetyl-CoA acyltransferase 2	ACAA2	7,05	4	4	5	60,87	41,97	
45	G1T1U7	Methylenetetrahydrofolate dehydrogenase, cyclohydrolase and formyltetrahydrofolate synthetase 1	MTHFD 1	30,7	45	43	74	Infinit y	101,19	
46	G1SYJ4	Enolase 1	ENO1	41,71	26	0	66	35,93	47,24	
47	G1T1V5	Carbonic anhydrase 3	CA3	63,2	21	21	69	Infinit y	30,35	
48	G1SHF3	Nitrilase 1	NIT1	3,98	1	1	2	Infinit y	35,78	
49	G1T6W7	Catalase	CAT	25,43	16	16	18	Infinit y	59,62	
50	G1SDV3	3-hydroxybutyrate dehydrogenase 2	BDH2	9,8	2	2	2	Infinit y	26,63	
51	G1SMM0	Beta-ureidopropionase 1	UPB1	34,64	14	14	17	Infinit y	43,24	
52	G1TPW2	Methylthioribose-1-phosphate isomerase	MRI1	9,86	3	3	3	Infinit y	38,66	
53	O19053	Alcohol dehydrogenase class-3	ADH5	16,84	9	5	19	Infinit y	39,57	
54	G1SPF5	Phosphoglycerate mutase 1	PGAM1	13,94	6	6	8	Infinit y	23,63	
55	G1SH60	Acyl-CoA synthetase short chain family member 2	ACSS2	3,83	6	6	6	Infinit y	79,02	
56	G1SVH0	Adenosylhomocysteinase	AHCY	26,12	26	26	53	Infinit y	58,47	
57	G1SDY5	Tyrosine 3-monooxygenase/tryptoph	YWHAZ	23,17	9	6	11	Infinit y	27,83	

		an 5-monooxygenase activation protein zeta								
58	Q28719	Prostaglandin reductase 1	PTGR1	6,3	7	7	9	Infinit y	38,19	K55 K126 K1
59	G1SDH5	1,2-dihydroxy-3-keto-5-methylthiopentene dioxygenase	ADI1	7,26	2	2	2	Infinit y	21,61	
60	G1TXN1	Nitrilase family member 2	NIT2	14,84	7	7	11	Infinit y	31,3	
61	G1TGN8	Adenylosuccinate synthetase	ADSSL1	2,68	1	1	1	Infinit y	36,75	
62	Q9GKX2	Dehydrogenase/reductase SDR family member 4 (Fragment)	DHRS4	7,69	5	0	5	Infinit y	27,41	
63	G1T704	Sorbitol dehydrogenase	SORD	39,83	29	29	98	Infinit y	38,14	
64	G1SE12	Electron transfer flavoprotein alpha subunit	ETFA	9,12	3	3	4	Infinit y	34,56	
65	G1TH33	Electron transfer flavoprotein beta subunit	ETFB	23,21	8	8	10	Infinit y	25,74	
66	G1SXZ7	Fumarate hydratase, mitochondrial	N/A	10,98	6	0	7	Infinit y	52,56	
67	G1T726	Hydroxyacyl-CoA dehydrogenase	HADH	18,15	7	7	7	Infinit y	82,46	34,34
68	G1SCQ1	Aldo-keto reductase family 7 like (gene/pseudogene)	AKR7L	24,45	13	8	18	Infinit y	39,84	
69	Q8WN94	Acyl-CoA-binding protein	DBI	39,08	5	5	6	Infinit y	9,91	
70	P07511	Serine hydroxymethyltransferase, cytosolic	SHMT	35,12	32	32	115	Infinit y	52,94	
71	G1TVT8	Glycerol-3-phosphate dehydrogenase [NAD(+)]	GPD1	29,89	16	16	30	Infinit y	37,28	
72	G1T5W4	Acyl-CoA dehydrogenase medium chain	ACADM	8,79	5	0	5	Infinit y	46,13	
73	G1TI71	UTP--glucose-1-phosphate uridylyltransferase	UGP2	37,86	26	26	48	Infinit y	57,44	
74	P00949	Phosphoglucomutase-1	PGM1	33,81	22	22	35	Infinit y	61,52	
75	G1SVJ1	Dihydropyrimidine dehydrogenase [NADP(+)]	DPYD	1,27	3	3	3	Infinit y	111,6	
76	G1T7S1	Aldo_ket_red domain-containing protein	N/A	30,72	16	10	20	Infinit y	37,24	
77	G1TQC4	Carbonyl reductase [NADPH] 1	CBR1	45,49	22	2	36	Infinit y	30,51	
78	G1T7Q5	Carboxylic ester hydrolase	LOC100352246	16,76	11	1	15	Infinit y	61,84	K57 K1
79	G1TES6	Hydroxysteroid 17-beta dehydrogenase 10	HSD17B10	23,37	6	6	7	Infinit y	27,08	
80	G1SKD9	Succinate--CoA ligase [ADP/GDP-forming] subunit alpha, mitochondrial	SUCLG1	4,34	2	2	2	Infinit y	36,2	
81	U3KMZ9	Aldo-keto reductase family 7 member A3	AKR7A3	22,11	7	4	12	Infinit y	21,02	
82	G1T545	Lactoylglutathione lyase	BTBD9	18,72	5	5	7	Infinit y	20,93	K160 K1
83	G1T678	Acetyl-CoA acetyltransferase 2	ACAT2	36,82	21	1	48	Infinit y	41,33	
84	G1TTJ1	Dehydrogenase/reductase 11	DHRS11	19,69	6	6	6	Infinit y	28,17	
85	G1SQG5	Malate dehydrogenase	MDH1	2,99	1	1	1	Infinit y	36,47	
86	G1U5N5	Lactamase_B domain-containing protein	N/A	15,43	3	3	4	Infinit y	18,6	
87	G1SKV7	Carnosine dipeptidase 2	CNDP2	7,65	6	6	7	Infinit y	55,27	
88	P23612	Tryptophan--tRNA ligase, cytoplasmic	WARS	6,95	3	3	3	Infinit y	45,76	53,76
89	G1SU89	FGGY_N domain-containing protein	N/A	3,12	2	2	3	Infinit y	51,41	

90	G1SG64	Arginase	ARG1	26,63	16	0	32	Infinit y	36,17	
91	G1SQA1	Carboxymethylenebuteno lidase homolog	CMBL	51,84	17	17	26	Infinit y	27,93	
92	P11974	Pyruvate kinase PKM	PKM	5,08	6	6	7	Infinit y	58,01	
93	G1SI20	Isocitrate dehydrogenase [NADP]	IDH1	34,94	23	23	40	Infinit y	46,87	
94	G1SYS5	Aldehyde dehydrogenase 7 family member A1	ALDH7 A1	14,44	9	9	13	Infinit y	70,34	
95	G1SZ63	Aldehyde dehydrogenase 9 family member A1	ALDH9 A1	20,05	15	14	27	Infinit y	46,44	
96	G1TFC9	Putative hydroxypyruvate isomerase	HYI	21,71	5	5	5	Infinit y	30,8	
97	G1T7Z6	Phosphoglycerate kinase	PGK1	5,74	4	0	5	Infinit y	44,68	
98	G1SCD6	Alcohol dehydrogenase 6 (class V)	ADH6	23,94	15	11	25	Infinit y	39,82	
99	G1SSW1	1-aminocyclopropane-1- carboxylate synthase homolog (inactive)	ACCS	9,02	4	4	5	Infinit y	57,31	
100	P46406	Glyceraldehyde-3- phosphate dehydrogenase	GAPDH	4,5	4	4	4	Infinit y	35,76	
101	G1ST90	Cystathionine gamma- lyase	CTH	21,65	11	11	13	Infinit y	44,89	
102	G1SKJ7	Glycine N- methyltransferase	GNMT	33,9	17	17	38	Infinit y	32,84	
103	G1U033	Gamma-butyrobetaine hydroxylase 1	BBOX1	5,68	2	2	2	27,79	44,64	
104	G1T0T2	Glucosidase alpha, neutral C	GANC	1,41	2	2	2	Infinit y	104,34	
105	G1SP54	Leukotriene A(4) hydrolase	LTA4H	3,76	4	4	4	Infinit y	69,05	
106	G1TB81	Cytidine deaminase	CDA	10,92	1	1	1	Infinit y	13,09	
107	G1T1G4	Amino adipate aminotransferase	AADAT	16,51	5	5	7	Infinit y	47,33	
108	G1T1H2	Hydroxyacid oxidase 1	HAO1	14,86	6	6	6	Infinit y	40,9	
109	G1SP80	Glucosylceramidase beta 3 (gene/pseudogene)	GBA3	19,19	13	13	20	Infinit y	53,6	
110	G1TKQ5	Pterin-4 alpha- carbinolamine dehydratase 1	PCBD1	23,08	3	3	5	Infinit y	11,99	
111	P12337	Liver carboxylesterase 1		36,64	28	28	45	Infinit y	62,25	
112	G1SH26	Glyoxalase domain containing 4	GLOD4	9,11	3	3	3	Infinit y	42,26	
113	P00567	Creatine kinase B-type	CKB	68,24	5	0	5	Infinit y	42,63	
114	G1SNJ9	Phosphoglycerate kinase	PGK2	7,43	2	0	6	Infinit y	44,73	
115	G1U723	3alpha/17beta/20alpha- hydroxysteroid dehydrogenase	PGER5	44,58	35	14	75	Infinit y	36,62	
116	G1SRP8	15-oxoprostaglandin 13- reductase	PTGR2	7,69	3	3	5	Infinit y	38,3	
117	P00883	Fructose-bisphosphate aldolase A	ALDOA	7,42	3	3	4	Infinit y	39,32	
118	G1U8R2	2-iminobutanoate/2- iminopropanoate deaminase	N/A	37,23	11	11	16	Infinit y	14,46	K56 K1
119	G1T616	Phosphoglucomutase 2	PGM2	3,72	3	3	3	Infinit y	68,66	

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120	G1TDS8	Pyridoxamine 5'-phosphate oxidase	PNPO	9,96	3	3	3	37,03	30,01	
121	G1T3R2	Urocanate hydratase 1	UROC1	7,54	7	7	8	Infinit y	87,66	
122	G1T3R4	Alcohol dehydrogenase class-2 isozyme 1	ADH2-1	45,12	35	0	66	40,8	40,23	K20 K1
123	G1T465	3alpha(17beta)-hydroxysteroid dehydrogenase	PGER6	21,05	11	0	21	Infinit y	36,63	
124	P14943	Liver carboxylesterase 2	CES2	4,89	3	0	5	Infinit y	59,02	
125	G1SS85	Glyoxylate and hydroxypyruvate reductase	GRHPR	17,08	9	9	10	Infinit y	34,56	
126	G1SJ9	Methionine sulfoxide reductase A	MSRA	9,44	3	3	4	Infinit y	25,88	
127	G1TN19	Ornithine carbamoyltransferase	OTC	3,95	5	5	6	56,81	39,88	
128	G1TEA7	Carbamoyl-phosphate synthase 1	CPS1	34,22	81	78	137	Infinit y	165,44	K531 K1
129	P11246	Arylamine N-acetyltransferase 2	NAT2	15,52	6	6	10	Infinit y	33,63	
130	G1SK42	Transglutaminase 2	TSM2	14,98	19	19	30	Infinit y	82,49	
131	Q95KM0	Arginase-1	ARG1	35,09	19	0	39	Infinit y	34,43	
132	Q9TV64	3-oxo-5-beta-steroid 4-dehydrogenase	AKR1D1	28,83	26	3	45	Infinit y	37,47	
133	Q9N1E2	Glucose-6-phosphate isomerase	GPI	13,62	11	11	12	Infinit y	62,71	
134	G1SIJZ8	Coproporphyrinogen oxidase	CPOX	3,38	3	3	3	37,01	49,51	
135	G1SQP9	Catechol-O-methyltransferase	COMT	17,91	7	7	14	Infinit y	29,87	
136	G1TD31	Acyl-CoA synthetase medium chain family member 1	ACSM1	8,84	5	5	6	Infinit y	64,53	
137	G1SIA4	Selenocysteine lyase	SCLY	8,98	3	3	3	Infinit y	44,1	
138	G1T332	Aspartate aminotransferase	GOT1	32,2	19	19	28	Infinit y	46,43	K20 K1
139	G1SIB6	Biliverdin reductase B	BLVRB	24,64	9	9	15	Infinit y	22,44	
140	G1SQS1	Aldose 1-epimerase	GALM	15,79	6	6	10	Infinit y	37,59	
141	G1T347	Serine dehydratase like	SDLS	7,58	5	5	5	Infinit y	34,56	
142	G1SIT9	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein beta	YWHAB	17,89	7	4	10	Infinit y	28,06	
143	O97972	Indolethylamine N-methyltransferase	INMT	7,6	3	3	4	Infinit y	28,94	
144	G1SX92	Secernin 2	SCRN2	5,4	3	3	3	Infinit y	46,6	
145	G1SFW1	Triokinase and FMN cyclase	TKFC	22,66	13	13	21	Infinit y	59,34	
146	G1SG80	Adenylate kinase 2, mitochondrial	AK2	20,92	4	4	9	Infinit y	26,34	
147	G1U450	Xylulokinase	XYLB	8,72	6	6	8	Infinit y	57,64	
148	G1U460	Aldehyde dehydrogenase 6 family member A1	ALDH6A1	6,7	3	3	3	Infinit y	61,49	
149	G1SP40	Amidohydrolase domain containing 1	AMDHD1	18,13	11	11	13	Infinit y	53,66	
150	G1SP48	UDP-glucose 6-dehydrogenase	UGDH	37,55	28	28	39	Infinit y	53,62	
151	G1SIJQ8	Carboxylic ester hydrolase	N/A	22,54	17	19	22	Infinit y	67,998	K126 K1
152	G1T225	Serine/threonine-protein kinase RIO1	RIOK1	3,35	2	2	5	24,093	65,104	K172 K1
153	G1SM04	Non-specific serine/threonine protein	STK3	1,63	1	1	2	23,404	56,268	K8 K10 K2

		kinase								
154	G1SN51	Carboxylic ester hydrolase	N/A	10,7	10	14	14	Infinit y	61,842	K65 K1
155	G1TYA7	L-lactate dehydrogenase	LDHB	29,91	19	15	39	Infinit y	36,61	
Components of cytoskeleton and transport proteins										
1	G1SNT8	Annexin	ANXA6	28,63	30	30	48	Infinit y	88,72	K153 K1
2	P51662	Annexin A1	ANXA1	10,4	4	4	4	Infinit y	38,71	
3	P33477	Annexin A11	ANXA1 1	3,18	1	1	2	Infinit y	54	
4	G1TKE3	Transgelin	TAGLN 2	0	3	3	3	25,06	21,42	
5	P19134	Serotransferrin	TF	20	15	15	22	Infinit y	76,62	
6	G1TCQ2	Fatty acid binding protein 1	FABP1	47,62	8	8	21	Infinit y	14,11	
7	G1SL10	Tubulin alpha chain	LOC100 348075	13,3	5	3	8	Infinit y	50,15	
8	P58776	Tropomyosin beta chain	TPM2	10,56	5	0	8	Infinit y	32,82	
9	P29751	Actin, cytoplasmic 1	ACTB	27,73	17	1	23	Infinit y	41,73	
10	G1TMV 1	Destrin, actin depolymerizing factor	DSTN	7,27	1	1	1	Infinit y	18,49	
11	G1SER8	Profilin	PFN1	24,49	2	2	5	Infinit y	10,6	
12	G1SXM 3	Pescadillo homolog	PES1	8,13	3	1	3	Infinit y	46,1	
13	G1TRY5	Plastin 3	PLS3	7,62	7	0	7	41,01	70,79	K11 K1
14	G1T543	Microsomal triglyceride transfer protein	MTTP	2,57	3	3	3	29,99	99,19	
15	P07489	Transthyretin	TTK	19,69	2	2	3	Infinit y	13,65	
16	G1U032	StAR related lipid transfer domain containing 10	STARD1 0	11,81	4	4	4	Infinit y	31,13	
17	O18750	Endoplasmic (Fragment)	HSP90B 1	7,82	4	0	5	Infinit y	82,56	
18	G1TT06	Selenium binding protein 1	SELENB P1	48,09	31	31	69	Infinit y	52,74	
19	G1SDB9	SEC14 like lipid binding 2	SEC14 L2	8,07	3	3	3	Infinit y	44,2	
20	Q9XS70	Coronin-1B	CORO1 B	3,7	3	3	3	47,79	53,58	
21	P53789	Vitamin D-binding protein	GC	2,31	6	6	6	60,52	52,88	
Protective enzymes										
1	G1TZE2	Glutathione S-transferase zeta 1	GSTZ1	65,44	24	24	47	Infinit y	24,26	
2	G1TIC9	Sulfurtransferase	TST	19,87	5	5	6	Infinit y	33,22	
3	G1TGI3	Sulfotransferase	N/A	6,53	3	0	4	Infinit y	34,98	
4	G1TAC4	Glutaredoxin-1	GLRX	11,21	3	3	4	Infinit y	11,95	
5	G1TAF8	Stress induced phosphoprotein 1	STIP1	3,5	5	5	5	38,51	62,5	
6	G1T0R9	Glutathione S-transferase	LOC100 357917	12,39	6	0	12	Infinit y	25,48	
7	G1SFV1	Protein disulfide- isomerase	PDIA4	4,73	5	5	5	Infinit y	66,7	
8	G1THZ6	Immunoglobulin heavy constant mu	IGHM	8,75	8	8	13	Infinit y	51,94	
9	P11909	Glutathione peroxidase 1	GPX1	44	18	5	19	Infinit y	21,87	
10	G1SQ02	Peroxioredoxin 1	PRDX1	41,71	22	21	31	Infinit y	22,14	
11	G1SYA5	S-formylglutathione	ESD	35	12	12	14	Infinit y	31,29	

		hydrolase								
12	B6V9S9	Chaperonin containing TCP1 subunit 2	CCT2	2,8	2	2	3	Infinit y	57,42	
13	G1SMM6	Betaine--homocysteine S-methyltransferase	BHMT	46,53	25	25	99	Infinit y	44,3	
14	P21195	Protein disulfide-isomerase	P4HB	18,66	15	15	20	Infinit y	56,77	
15	G1U1Q8	Protein disulfide-isomerase	MIF	7,83	1	1	1	Infinit y	12,35	
16	G1T840	Heat shock 110 kDa protein	HSPH1	3,49	2	4	4	Infinit y	96,793	K82, K84, K95, K3
17	G1T4A7	Glutathione transferase	N/A	27,63	21	15	70	Infinit y	29,29	
18	G1U9R0	Glutathione S-transferase pi 1	GSTP1	46,67	16	16	25	Infinit y	23,48	K128 K1
19	G1TED0	Sulfurtransferase	MPST	7,52	5	5	8	Infinit y	33,93	
20	G1SPZ7	Glutathione peroxidase	GPX1	63,45	20	1	24	Infinit y	16,17	
21	G1TD98	Glutathione reductase	GSR	2,52	2	2	2	Infinit y	51,61	
22	G1T9M9	Heat shock protein family A (Hsp70) member 8	HSPA8	22,53	24	21	35	Infinit y	71,04	
23	G1TLH1	Glutathione S-transferase mu 4	GSTM4	23,21	13	4	17	Infinit y	25,99	K58 K1
24	P01832	Polymeric immunoglobulin receptor	PIGR	1,55	4	4	5	Infinit y	83,83	
25	P08628	Thioredoxin	TXN	20,95	6	6	9	Infinit y	11,75	
26	G1SKS9	Thioredoxin reductase 1, cytoplasmic	TXNRD1	4,88	2	2	2	Infinit y	71,37	
27	Q08863	Glutathione S-transferase alpha I		49,33	28	20	87	Infinit y	25,67	
28	Q08862	Glutathione S-transferase Yc		61,54	31	21	172	Infinit y	25,43	
29	G1SVP7	Glutathione S-transferase omega 1	GSTO1	35,68	13	13	21	Infinit y	27,63	
30	P30946	Heat shock protein HSP 90-alpha	HSP90A A1	29,11	35	18	55	Infinit y	83,42	K303 K1
31	P46409	Glutathione S-transferase Mu 1		61,01	25	5	38	Infinit y	25,4	
32	G1T2B1	Glutathione transferase	GSTA5	42,34	19	10	71	Infinit y	25,56	
33	G1T8Z0	Peroxiredoxin 6	PRDX6	58,15	17	17	29	Infinit y	25,23	
34	G1U7L4	Heat shock protein family A (Hsp70) member 5	HSPA5	10,99	11	8	16	Infinit y	72,39	
35	P01840	Ig kappa-b4 chain C region		13,59	1	1	1	Infinit y	11,04	
36	G1SQM2	Epoxide hydrolase 2	EPHX2	22,26	17	17	30	Infinit y	67,62	
37	G1U045	Sulfotransferase	SULT3A1	41,53	25	3	66	Infinit y	35,94	
38	G1T3Y8	Heat shock protein family D (Hsp60) member 1	HSPD1	12,36	13	13	14	Infinit y	56,63	
39	G1SH63	Glutathione synthetase	GSS	9,05	4	4	4	Infinit y	52,18	
40	G1SZ44	10 kDa heat shock protein, mitochondrial	HSPE1	43,14	7	7	9	Infinit y	10,92	
41	G1SHZ8	Chaperonin containing TCP1 subunit 8	CCT8	7,19	3	3	3	Infinit y	60,62	
42	G1SCN8	T-complex protein 1 subunit gamma	CCT3	4,04	6	6	7	Infinit y	60,55	
43	G1U9T8	T-complex protein 1 subunit delta	CCT4	2,47	4	4	4	Infinit y	56,99	
44	O77622	T-complex protein 1 subunit zeta	CCT6	2,45	2	0	3	Infinit y	57,98	

45	Q9TTC6	Peptidyl-prolyl cis-trans isomerase A	PPIA	32,32	10	0	16	Infinity	17,83	
46	P62943	Peptidyl-prolyl cis-trans isomerase FKBP1A	FKBP1A	25	3	3	3	Infinity	11,94	
47	P27124	Peptidyl-prolyl cis-trans isomerase FKBP4	FKBP4	8,08	6	6	7	Infinity	51,44	
Proteins of signal transduction and regulation of enzyme activity										
1	G1TC46	S-adenosylmethionine synthase	MAT1A	28,32	18	11	27	Infinity	43,92	
2	P62160	Calmodulin	CALM	29,53	5	5	8	Infinity	16,83	
3	G1T7R2	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein epsilon	YWHAE	36,08	12	10	16	Infinity	29,17	
4	P30801	Protein S100-A6	S100A6	18,89	1	1	1	Infinity	10,15	
5	G1T623	Glucokinase regulator	GSKR	8,36	6	6	6	Infinity	68,29	
6	G1SYP5	Tetratricopeptide repeat domain 36	TTC36	25	5	5	5	Infinity	19,97	
7	Q9TTJ6	Regucalcin	RGN	42,14	22	22	35	Infinity	33,09	
8	G1SNS5	Rab GDP dissociation inhibitor		7,62	5	5	6	Infinity	50,54	
9	G1SS96	Kinase suppressor of ras 1	KSR1	0,94	1	2	2	27,289	94,456	K220
Protein regulators of gene expression, cell division, and differentiation										
1	P68105	Elongation factor 1-alpha 1	EEF1A1	24,68	24	11	45	Infinity	50,11	
2	P34826	Elongation factor 1-beta	EEF1B	10,22	2	2	2	Infinity	24,73	
3	P29694	Elongation factor 1-gamma	EEF1G	5,03	6	6	7	Infinity	50,02	
4	P53787	Elongation factor 1-delta	EEF1D	15,71	5	5	6	Infinity	31,05	
5	G1SUU7	tRNA-splicing ligase RtcB homolog	RTCB	2,86	4	4	4	Infinity	53,77	
6	G1SDU6	Threonyl-tRNA synthetase	TARS	1,66	2	2	2	Infinity	83,42	
7	G1SW24	Alanyl-tRNA synthetase	AARS	3,94	5	5	5	Infinity	108,97	
8	G1SNM1	Glycyl-tRNA synthetase	GARS	3,65	3	3	3	38,34	77,41	
9	G1SYB4	Cell division control protein 42 homolog	CDC42	9,27	2	2	2	Infinity	22,83	
10	G1SN05	RNA helicase	N/A	13,27	9	9	9	Infinity	46,37	
11	P80912	Histidine triad nucleotide-binding protein 1	HINT1	26,19	3	3	4	Infinity	13,68	
12	O19049	Heterogeneous nuclear ribonucleoprotein K	HNRNP K	6,26	6	1	8	Infinity	50,93	
13	P41035	Eukaryotic translation initiation factor 2 subunit 2	EIF2S2	3,6	2	2	3	Infinity	38,3	
14	G1U719	DExD-box helicase 39B	DDX39 B	4,98	3	3	3	Infinity	50,5	
15	G1T443	Chromosome 11 open reading frame 54	C11orf54	7,94	5	5	6	Infinity	34,82	