

Mice completely lacking immunoproteasomes display major alterations in antigen presentation.

Authors:

Eleanor Z Kincaid¹, Jenny W Che¹, Ian York², Hernando Escobar³, Eduardo Reyes-Vargas³, Julio C. Delgado³, Raymond M Welsh¹, Margaret L. Karow⁴, Andrew J. Murphy⁴, David M. Valenzuela⁴, George D. Yancopoulos⁴ and Kenneth L Rock¹

¹Department of Pathology, UMass Medical School. Worcester, MA

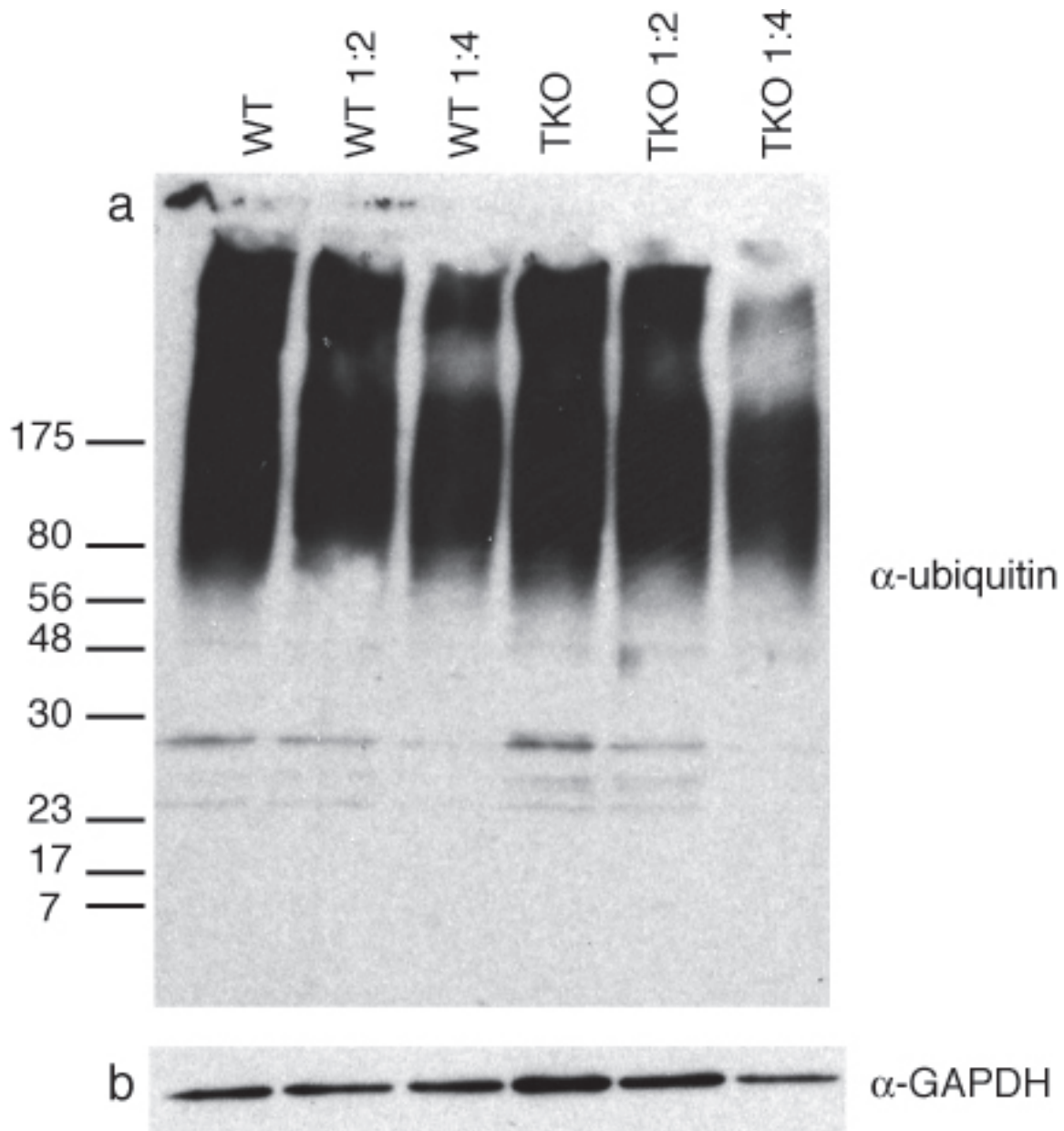
²CDC/NCIRD, Influenza Division-Molecular Virology and Vaccine Branch, Atlanta GA.

³ARUP Institute for Clinical and Experimental Pathology, Department of Pathology, University of Utah School of Medicine, Salt Lake City, UT

⁴Regeneron Pharmaceuticals Inc., Tarrytown, NY 10591

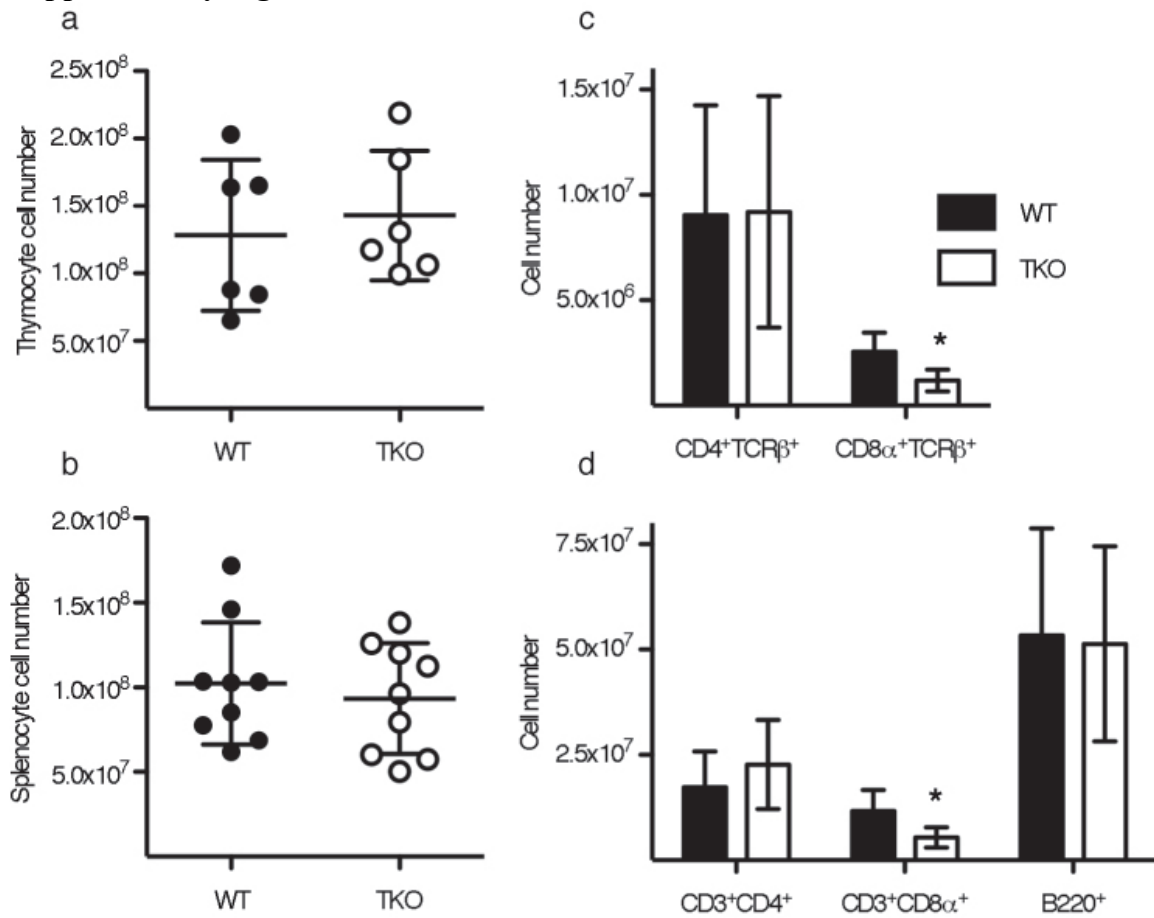
Correspondence should be addressed to K.R. (kenneth.rock@umassmed.edu).

Supplementary Figure 1.



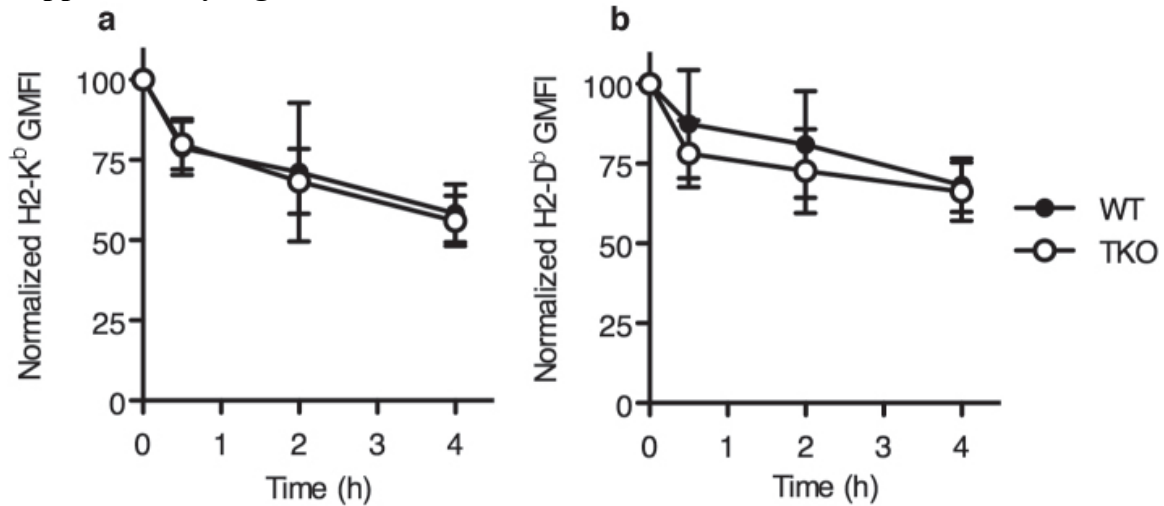
Steady-state ubiquitylation in TKO splenocytes. Western blots of serial dilutions (20 μ g, 10 μ g and 5 μ g) of whole cell lysates from WT and TKO splenocytes. After probing with (a) anti-ubiquitin, blot was stripped with Millipore Re-blot and reprobbed with (b) GAPDH as a loading control. (Representative of 2 experiments.)

Supplementary Figure 2.



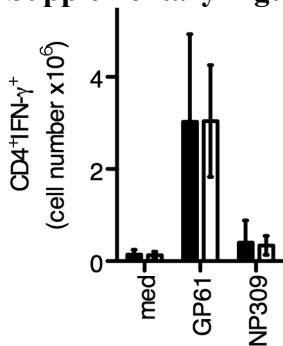
Cell numbers in WT and TKO thymus and spleen. Organs were harvested from mice of the indicated strains. Thymocytes and splenocytes (after red blood cell lysis) were counted. Thymocytes were stained with anti-TCRβ, anti-CD4, and anti-CD8α. Splenocytes were stained with anti-B220, anti-CD3 molecular complex and anti-CD4, and anti-CD8α. Scatter plots indicate individual animals with mean +/- SD indicated. Bar graphs indicate mean +/- Asterisks indicate a significant difference from WT (P < 0.05, student's t-test, n of 6 or 9 for each strain, combined from 2 experiments).

Supplementary Figure 3.



Stability of pMHC I complexes on the cell surface of TKO splenocytes. Splenocytes from WT and TKO animals were treated with 1 μ l/ml GolgiPlug (BDBioscience) at 37⁰C for the indicated times before surface Ab staining and flow cytometry. Data is mean +/- SD of 3 animals from each strain, combined from 3 experiments. Splenocytes from each animal were treated and stained in triplicate, and the mean from each animal was used. H2-K^b or H2-D^b GMFI was normalized to time 0 (no treatment) for each strain in each experiment. No significant difference was found between WT and TKO samples (two-way ANOVA).

Supplementary Figure 4.



CD4 responses are normal in LCMV-infected TKO animals. WT and TKO animals were infected with LCMV, and 9 days later, spleen lymphocytes were analyzed by *in vitro* restimulation followed by surface and intracellular staining. Mean and SD of 18 animals, combined from 4 experiments.

Supplementary Figure 5.



WT hosts do not reject TKO splenocytes. WT mice were injected with WT and KO cells differentially labeled with CFSE. Mice were bled at the indicated times, and the relative killing of WT and TKO cells was assessed. Mean \pm SD from 14 mice, 3 experiments.

Supplemental Table 1. WT H2-D^b peptides.

Accession number	Peptide	mass-to-charge ratio	Protein entry name
A2AIV2	RQILNADAM	1031.531	Protein virilizer homolog
A3KGF7	TQPLNHYFI	1132.579	1-phosphatidylinositol-4,5-bisphosphate phosphodiesterase beta-2
B1AXP6	SSIRNFLIYV	1211.704	Mitochondrial import receptor subunit TOM5 homolog
O08808	MMHSNMETL	1093.448	Protein diaphanous homolog 1
O35598	SGIRNISFM	1024.525	ADAM 10
O35604	VAVVNKVDI	956.578	Niemann-Pick C1 protein
O35737	FSPLNPVRV	1028.589	Heterogeneous nuclear ribonucleoprotein H
O55222	FSHPNVLPV	1009.547	Integrin-linked protein kinase
O88491	ASMINVEYL	1039.513	Histone-lysine N-methyltransferase, H3 lysine-36 and H4 lysine-20 specific
P01899	FAYEGRDYI	1133.527	H-2 class I histocompatibility antigen, D-B alpha chain
P04441	SQMRMATPL	1034.513	H-2 class II histocompatibility antigen gamma chain
P07742	FQIVNPHLL	1080.621	Ribonucleoside-diphosphate reductase large subunit
P07742	YGIRNSLLI	1048.616	Ribonucleoside-diphosphate reductase large subunit
P08775	VVVENNELI	971.541	DNA-directed RNA polymerase II subunit RPB1
P09581	FAPKNIYSI	1052.578	Macrophage colony-stimulating factor 1 receptor
P10126	FAPVNVTEV	1076.563	Elongation factor 1-alpha 1
P10126	FAPVNVTEVKSV	1390.758	Elongation factor 1-alpha 1
P14576	ATIINEEVL	1001.552	Signal recognition particle 54 kDa protein
P14901	IQAENAEFM	1052.472	Heme oxygenase 1
P16277	RSLDNGGYYI	1157.559	Tyrosine-protein kinase BLK
P16546	KALINADEL	986.552	Spectrin alpha chain, brain
P16858	SAPSADAPMFV	1092.504	Glyceraldehyde-3-phosphate dehydrogenase
P16858	SAPSADAPMFVM	1223.544	Glyceraldehyde-3-phosphate dehydrogenase
P17918	AMGVNLTSM	923.433	Proliferating cell nuclear antigen
P19096	TALENLSTL	961.521	Fatty acid synthase
P19973	RQPSIELPSM	1157.599	Lymphocyte-specific protein 1
P23492	SLITNKVVM	1004.581	Purine nucleoside phosphorylase
P24547	GGIQNVGHI	894.48	Inosine-5'-monophosphate dehydrogenase 2
P24638	RSIQNAQFL	1076.585	Lysosomal acid phosphatase
P26039	SVMENSKVLGEAM	1394.666	Talin-1
P26039	VMVTNVTSL	963.519	Talin-1
P27005	VQNINIENL	1056.569	Protein S100-A8
P27773	FAHTNIESL	1031.516	Protein disulfide-isomerase A3
P28063	GGVVNMYHM	1007.444	Proteasome subunit beta type-8
P28658	NSIRNLDTI	1045.564	Ataxin-10
P35278	AMNVNEIFM	1068.486	Ras-related protein Rab-5C
P42228	SILVNQEVL	1014.584	Signal transducer and activator of transcription 4
P46414	FGPVNHEEL	1041.501	Cyclin-dependent kinase inhibitor 1B
P48410	AALVSRFTL	977.578	ATP-binding cassette sub-family D member 1
P51943	VSLLNPPETL	1082.61	Cyclin-A2
P55194	ALIQNADTL	958.521	SH3 domain-binding protein 1
P55264	SAVVDKDFL	993.526	Adenosine kinase
P58462	SMAENSIPL	961.467	Forkhead box protein P1
P59016	ASLVNADKL	930.526	Vacuolar protein sorting-associated protein 33B
P59326	GSVVNSVAL	845.473	YTH domain family protein 1
P61161	YAGSNFPEHI	1134.522	Actin-related protein 2
P61982	AAMKNVTEL	976.514	14-3-3 protein gamma
P70168	AALQNLVKI	969.61	Importin subunit beta-1
P70259	LSNIINESL	1002.547	G-protein coupled receptor 143
P70333	FSPLNPMRV	1060.561	Heterogeneous nuclear ribonucleoprotein H2
P70372	GAVTNVKVI	900.552	ELAV-like protein 1
P70428	ASVSNPLFL	947.52	Exostosin-2
P80315	SSLLSPMSV	920.476	T-complex protein 1 subunit delta
P84089	YQPYNKDWI	1226.585	Enhancer of rudimentary homolog
P97313	SALINLVEF	1005.562	DNA-dependent protein kinase catalytic subunit
P97929	HAIENIDTF	1059.511	Breast cancer type 2 susceptibility protein homolog
Q01237	SGPTNEDLYI	1108.516	3-hydroxy-3-methylglutaryl-coenzyme A reductase

Q09XV5	VQVPNLESL	998.552	Chromodomain-helicase-DNA-binding protein 8
Q14DL0	TALLDEQVL	1001.552	Ubiquilin-like protein
Q3SXB8	DEAANGLMASYL	1254.568	Collectin-11
Q3THE2	SLGKNPTDAYL	1178.606	Myosin regulatory light chain MRLC2
Q3U3D7	ASLVNSPSYL	1050.547	Transmembrane protein 131-like
Q3ULJ0	GALKNIVAV	884.557	Glycerol-3-phosphate dehydrogenase 1-like protein
Q3UM45	RAIENIDTL	1044.569	Protein phosphatase 1 regulatory subunit 7
Q3UWM4	SSIQNGKYTL	1110.58	JmjC domain-containing histone demethylation protein 1D
Q5DU02	FAVVNHQGTL	1085.574	Ubiquitin carboxyl-terminal hydrolase 22
Q5EG47	WKVVNPYYL	1181.636	5'-AMP-activated protein kinase catalytic subunit alpha-1
Q60585	VMLENYSHL	1105.535	Zinc finger protein 30
Q60597	SAPVAAEPF	888.447	2-oxoglutarate dehydrogenase E1 component, mitochondrial
Q60597	SAPVAAEPFL	1001.531	2-oxoglutarate dehydrogenase E1 component, mitochondrial
Q61081	NMPWNVDTL	1089.504	Hsp90 co-chaperone Cdc37
Q61191	SQVINPTAI	942.526	Host cell factor
Q61548	NGVINAAFPM	936.461	Clathrin coat assembly protein AP180
Q61753	TGVVNAQAL	872.484	D-3-phosphoglycerate dehydrogenase
Q64511	NSMVLFDHM	1093.481	DNA topoisomerase 2-beta
Q68FD5	SAIMNPASKVI	1130.624	Clathrin heavy chain 1
Q69ZF8	ATVSNPFFL	905.473	Male-specific lethal 2 homolog
Q6RT24	SALQNAESDRL	1203.597	Centromere-associated protein E
Q6VNB8	LASGNPAIV	841.478	WD repeat and FYVE domain-containing protein 3
Q6WKZ8	SLPTNLIHL	1007.589	E3 ubiquitin-protein ligase UBR2
Q71LX4	SVMENSKVLGESM	1410.661	Talin-2
Q7TMB8	YAPLHLVPL	1022.604	Cytoplasmic FMR1-interacting protein 1
Q7TN89	SGVGKSALTI	932.542	GTPase ERas
Q7TPS5	AAVLNPRFL	1000.594	Uncharacterized protein KIAA0528
Q80SU7	GMIENGPFL	977.477	Interferon-induced very large GTPase 1
Q80SU7	ISLKNSQEI	1031.574	Interferon-induced very large GTPase 1
Q80TG1	FSLENLRMTNT	1325.652	Uncharacterized protein KIAA1267
Q80TH2	GSLKNVTTL	932.542	Protein LAP2
Q80U28	IAPTNAEVL	927.515	MAP kinase-activating death domain protein
Q80VH0	NSPFNSKFPA	1108.543	B-cell scaffold protein with ankyrin repeats
Q80V11	AALQNAVAF	904.489	Tripartite motif-containing protein 56
Q80X90	PGSANETSSIL	1075.527	Filamin-B
Q80Y17	VSVANVDLL	929.531	Lethal(2) giant larvae protein homolog 1
Q80YQ8	WAVSNREML	1105.546	Protein RMD5 homolog A
Q811L6	SKLANIDYL	1036.568	Microtubule-associated serine/threonine-protein kinase 4
Q8BG67	SAINEDNL	988.495	Protein EFR3 homolog A
Q8BHY8	IGPKNYEFL	1080.573	Sorting nexin-14
Q8BIH0	AAPINTQGL	884.484	Histone deacetylase complex subunit SAP130
Q8BPI1	VSLNNAVIVL	1041.631	Protein kintoun
Q8BPS4	SALANYIHL	1001.542	Integral membrane protein GPR180
Q8BW56	SSVLNLTTEL	975.536	Glycosyltransferase-like domain-containing protein 1
Q8BX57	SSIQNFQKGTL	1222.643	PX domain-containing protein kinase-like protein
Q8BZQ7	AMLTNLESL	991.513	Anaphase-promoting complex subunit 2
Q8C0L9	FGIHNGVETL	1086.558	Putative glycerophosphodiester phosphodiesterase 5
Q8C3J5	KSVENFVSL	1022.552	Dedicator of cytokinesis protein 2
Q8C3J5	SMVQNRVFL	1093.583	Dedicator of cytokinesis protein 2
Q8C3J5	SQFPNAEKM	1051.488	Dedicator of cytokinesis protein 2
Q8C4N4	SAPINSVLL	913.536	PQ-loop repeat-containing protein 2
Q8C4V1	MGILNTDTL	977.498	Rho GTPase-activating protein 24
Q8CDJ3	SQHVNLDQL	1053.533	Uncharacterized protein KIAA0831
Q8CDN6	FQNVNSVTL	1021.532	Thioredoxin-like protein 1
Q8CEF1	IQPINHTTL	1036.579	Protein fem-1 homolog C
Q8CGC7	SAVQELLQL	1000.568	Bifunctional aminoacyl-tRNA synthetase
Q8CGP5	LAIRNDEEL	1072.564	Histone H2A type 1-F
Q8CJF7	TSVENHEFL	1075.506	AT-hook-containing transcription factor 1
Q8K1E0	ASMSNDFKSVL	1198.578	Syntaxin-5
Q8K1H7	AAAKNLSDMTL	1134.583	T-complex protein 11-like protein 2
Q8K3C0	NGPQNIYNL	1032.511	Ribonuclease kappa
Q8K4G5	GQLILKEEM	1060.571	Actin-binding LIM protein 1

Q8R317	RALSNLESI	1002.558	Ubiquilin-1
Q8R4R6	AQYGNILKHMV	1273.673	Nucleoporin NUP53
Q8VE11	VGIENIHVM	1011.53	Myotubularin-related protein 6
Q8VH51	FEPFGRIESI	1194.616	RNA-binding protein 39
Q8VIJ8	SAVKNLQQL	1000.579	UPF0171 protein C16orf35 homolog
Q91V83	QTVENVEHL	1068.533	Uncharacterized protein KIAA0406 homolog
Q91WG4	SAPRNFVENF	1180.575	Elongator complex protein 2
Q91WM3	AALLNTDLV	929.531	U3 small nucleolar RNA-interacting protein 2
Q91WT8	ISPVNPVAI	909.541	RNA-binding protein 47
Q91XF4	SAPVNGSVFI	990.526	E3 ubiquitin-protein ligase RNF167
Q91XU3	FAIDDHDYL	1108.495	Phosphatidylinositol-5-phosphate 4-kinase type-2 gamma
Q922D8	AGILNGKLV	884.557	C-1-tetrahydrofolate synthase, cytoplasmic
Q99JF5	TAPVNIAMI	897.541	Diphosphomevalonate decarboxylase
Q99JW2	FSPMNRTPV	1048.525	Aminoacylase-1
Q99K90	SSLVNSQTL	948.5	Mitogen-activated protein kinase kinase kinase 7-interacting protein 2
Q99K95	RSIKNVTEL	1059.616	UPF0549 protein C20orf43 homolog
Q99KD5	SGLQNFEAL	978.49	Protein unc-45 homolog A
Q99KN9	SSPSNMLPV	931.456	Clathrin interactor 1
Q99KV1	MAPQNLSTF	1008.482	DnaJ homolog subfamily B member 11
Q99N16	SAYLNMFEDI	1224.572	Cytochrome P450 4F3
Q99NH0	ASVLNVNHI	966.537	Ankyrin repeat domain-containing protein 17
Q99PL5	SSIVNSIQVL	1059.605	Ribosome-binding protein 1
Q9CQ71	NELPQFFP	991.489	Replication protein A 14 kDa subunit
Q9CR64	SAIFNFQSL	1026.526	Transmembrane protein 167A
Q9D020	GALKNTDYF	1028.505	Cytosolic 5'-nucleotidase 3
Q9D0E1	GMGFGLERM	997.46	Heterogeneous nuclear ribonucleoprotein M
Q9D3G9	YSVANHNSFL	1151.549	Rho-related GTP-binding protein RhoH
Q9D6Z1	VALENANAV	900.479	Nucleolar protein 5A
Q9D757	AKIQMLDAL	1002.566	Death-associated protein-like 1
Q9D868	SSPVNPVVF	945.505	Peptidyl-prolyl cis-trans isomerase H
Q9DB27	IGIENIHYL	1071.584	Malignant T cell amplified sequence 1
Q9DB40	SGLLNQQSL	959.516	Mediator of RNA polymerase II transcription subunit 27
Q9DBN5	VGVNNPVFL	958.536	Peroxisomal Lon protease homolog 2
Q9DBR3	GAVQNIHFL	922.511	Armadillo repeat-containing protein 8
Q9EQ32	YGLKNLTAL	992.578	Phosphoinositide 3-kinase adapter protein 1
Q9EQU3	LSHTNILVL	1009.605	Toll-like receptor 9
Q9ERE3	YSIVNASVL	965.531	Serine/threonine-protein kinase Sgk3
Q9ET01	VGVENVAEL	929.494	Glycogen phosphorylase, liver form
Q9JHC9	SAPSAIALPV	925.536	ETS-related transcription factor Elf-2
Q9JKP8	VSSINQEAL	960.5	Chromatin accessibility complex protein 1
Q9QVP9	VAREEVVL	914.531	Protein tyrosine kinase 2 beta
Q9QZD9	FGPINSVAF	951.494	Eukaryotic translation initiation factor 3 subunit I
Q9R190	YAPINANAI	946.5	Metastasis-associated protein MTA2
Q9R1A8	YVVDNIDHL	1087.542	E3 ubiquitin-protein ligase RFWD2
Q9WTK5	AALQNLEQL	999.548	Nuclear factor NF-kappa-B p100 subunit
Q9WU84	VQLENQMVV	1073.566	Copper chaperone for superoxide dismutase
Q9WVH9	TGPISATLVM	989.534	Fibulin-5
Q9Z1F9	SMAGNIIPAI	986.534	SUMO-activating enzyme subunit 2
Q9Z1T1	AAPQNFTPSMI	1176.572	AP-3 complex subunit beta-1
Q9Z2G1	VQPFNYVTL	1080.573	Protein fem-1 homolog A-A
Q9Z2U4	FSPFNPTSL	1009.5	ETS-related transcription factor Elf-4

Supplemental Table 2. TKO H2-D^b peptides.

Accession number	Peptide	mass-to-charge ratio	Protein entry name
A6PWY4	FSPTNPAHLL	1096.579	WD repeat-containing protein 76
O35127	SAPENAVRM	974.473	Protein C10
O35286	FAHIDGDHL	1024.485	Putative pre-mRNA-splicing factor ATP-dependent RNA helicase DHX15
O35368	GTFVNGEFV	969.468	Interferon-activable protein 203
O35484	VSPENIIFT	1019.541	Antizyme inhibitor 1
O35683	ISGVNRYVYV	1070.564	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1
O35737	FSPLNPVRV	1028.589	Heterogeneous nuclear ribonucleoprotein H
O35988	KAPTNEFYA	1040.505	Syndecan-4
O54734	GGNINVETI	916.474	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase 48 kDa subunit
O70551	ISGVNGTHI	897.479	Serine/threonine-protein kinase SRPK1
O88491	ASMINVEYL	1039.513	Histone-lysine N-methyltransferase, H3 lysine-36 and H4 lysine-20 specific
O89090	LQVQNQAQTI	1239.67	Transcription factor Sp1
P00520	SSGINGSFL	881.437	Proto-oncogene tyrosine-protein kinase ABL1
P01899	FAYEGRDYI	1133.527	H-2 class I histocompatibility antigen, D-B alpha chain
P04441	SQMRMATPL	1034.513	H-2 class II histocompatibility antigen gamma chain
P07742	FQIVNPHLL	1080.621	Ribonucleoside-diphosphate reductase large subunit
P08775	VTPFNIDRL	1074.595	DNA-directed RNA polymerase II subunit RPB1
P09581	FAPKNIYSI	1052.578	Macrophage colony-stimulating factor 1 receptor
P10126	FAPVNVTTTEV	1076.563	Elongation factor 1-alpha 1
P10126	FAPVNVTTTEVKSV	1390.758	Elongation factor 1-alpha 1
P10126	PPMEAAGFTAQVI	1331.667	Elongation factor 1-alpha 1
P13864	LSLENGHTL	1084.564	DNA (cytosine-5)-methyltransferase 1
P14901	IQAENAEFM	1052.472	Heme oxygenase 1
P16277	RSLDNGGYI	1157.559	Tyrosine-protein kinase BLK
P16460	FININSLRL	1089.642	Argininosuccinate synthase
P16546	KALINADEL	986.552	Spectrin alpha chain, brain
P16858	SAPSADAPMFVM	1223.544	Glyceraldehyde-3-phosphate dehydrogenase
P16858	YGYSNRVVDLM	1316.631	Glyceraldehyde-3-phosphate dehydrogenase
P17918	AMGVNLTSM	923.433	Proliferating cell nuclear antigen
P18760	SAVISLEGKPL	1113.652	Cofilin-1
P19096	TALLENLSTL	961.521	Fatty acid synthase
P19973	RQPSIELPSM	1157.599	Lymphocyte-specific protein 1
P20693	TAIQNVSHV	968.516	Low affinity immunoglobulin epsilon Fc receptor
P24547	GGIQNVGHI	894.48	Inosine-5'-monophosphate dehydrogenase 2
P26039	SGPENFQVG	934.427	Talin-1
P26039	SVMENSKVLGEAM	1394.666	Talin-1
P30282	AAVIAHDFL	956.52	G1/S-specific cyclin-D3
P35278	AMNVNEIFM	1068.486	Ras-related protein Rab-5C
P36423	LGPKNGVYI	960.552	Thromboxane-A synthase
P39054	YAIKNIHGV	1014.574	Dynamin-2
P40694	VNNHAFLETL	1157.595	DNA-binding protein SMUBP-2
P42228	SILVNQEVL	1014.584	Signal transducer and activator of transcription 4
P46414	FGPVNHEEL	1041.501	Cyclin-dependent kinase inhibitor 1B
P47911	FSLTNGMYP	1029.472	60S ribosomal protein L6
P49718	AALPNIYEL	1003.546	DNA replication licensing factor MCM5
P49813	SSIVNKEGL	946.521	Tropomodulin-1
P51943	VLLNPPETL	1082.61	Cyclin-A2
P54841	YQQMNPEAL	1093.499	Transcription factor MafB
P55264	SAVVDKDFL	993.526	Adenosine kinase
P58462	SMAENSIPL	961.467	Forkhead box protein P1
P58929	SSPTSTEYI	984.453	Glucocorticoid modulatory element-binding protein 2
P59016	ASLVNADKL	930.526	Vacuolar protein sorting-associated protein 33B
P61161	YAGSNFPEHI	1134.522	Actin-related protein 2
P61982	AAMKNVTEL	976.514	14-3-3 protein gamma
P62264	FASFNDTFVHV	1283.606	40S ribosomal protein S14

P62830	AAGVGDMVM	850.38	60S ribosomal protein L23
P62843	VG VYNGKTF	984.515	40S ribosomal protein S15
P62855	FVIRNIVEA	1060.616	40S ribosomal protein S26
P70168	AALQNLVKI	969.61	Importin subunit beta-1
P70372	FSPMGVDHM	1020.428	ELAV-like protein 1
P70372	GAVTNVKVI	900.552	ELAV-like protein 1
P70428	ASVSNPLFL	947.52	Exostosin-2
P83741	ASLQNFNISNL	1220.628	Serine/threonine-protein kinase WNK1
P97313	SALINLVEF	1005.562	DNA-dependent protein kinase catalytic subunit
P97384	AGQFNQDYL	1055.48	Annexin A11
P97929	HAIENIDTF	1059.511	Breast cancer type 2 susceptibility protein homolog
Q00175	VGLPNESQAL	1027.542	Progesterone receptor
Q01237	SGPTNEDLYI	1108.516	3-hydroxy-3-methylglutaryl-coenzyme A reductase
Q09XV5	VQVPNLESL	998.552	Chromodomain-helicase-DNA-binding protein 8
Q0P5W1	GVHVNQELL	1008.548	Vacuolar protein sorting-associated protein 8 homolog
Q14DL0	TALLDEQVL	1001.552	Ubiquilin-like protein
Q2HXL6	FMATNPEHL	1059.493	ER degradation-enhancing alpha-mannosidase-like 3
Q3TCJ1	SQISNTEFL	1038.511	Protein FAM175B
Q3TGF2	LAPQNKPEL	1009.568	Protein FAM107B
Q3U1N2	AAVQNPAITAL	1068.605	Sterol regulatory element-binding protein 2
Q3UHH1	SQPVNPHSL	978.501	Zinc finger SWIM domain-containing protein KIAA0913
Q3UIK4	AAPRSFIFL	1021.584	Methyltransferase-like protein KIAA1627
Q3ULJ0	GALKNIVAV	884.557	Glycerol-3-phosphate dehydrogenase 1-like protein
Q3UM45	RAIENIDTL	1044.569	Protein phosphatase 1 regulatory subunit 7
Q3UWM4	SSIQNGKYTL	1110.58	JmjC domain-containing histone demethylation protein 1D
Q497V5	FVRINQDYI	1167.616	S1 RNA-binding domain-containing protein 1
Q60520	LVIFNQEVI	1074.62	Paired amphipathic helix protein Sin3a
Q60585	VMLENYSHL	1105.535	Zinc finger protein 30
Q60597	SAPVAAEPF	888.447	2-oxoglutarate dehydrogenase E1 component, mitochondrial
Q60597	SAPVAAEPFL	1001.531	2-oxoglutarate dehydrogenase E1 component, mitochondrial
Q60843	SGPRNPFPPP	1065.548	Krueppel-like factor 2
Q60973	YMPQNPHII	1112.556	Histone-binding protein RBBP7
Q60974	YAMENTRQTI	1226.584	Nuclear receptor corepressor 1
Q61191	SQVINPTAI	942.526	Host cell factor
Q61191	VMVSNPATRM	1105.55	Host cell factor
Q61286	STVAASNTEL	992.49	Transcription factor 12
Q61419	VGLTNINVV	928.547	Cytidine monophosphate-N-acetylneuraminic acid hydroxylase
Q61687	SNYQQIDMRGM	1342.588	Transcriptional regulator ATRX
Q62190	ARSLNYLLYV	1211.679	Macrophage-stimulating protein receptor
Q62384	LVTKNPFTL	1032.609	Zinc finger protein ZPR1
Q64511	NSMVLFDHM	1093.481	DNA topoisomerase 2-beta
Q68FD5	SAIMNPASKVI	1130.624	Clathrin heavy chain 1
Q69ZK6	SLLGGHPRL	949.558	Probable JmjC domain-containing histone demethylation protein 2C
Q69ZK6	WQYPNGTHA	1073.48	Probable JmjC domain-containing histone demethylation protein 2C
Q6PAC3	YSPTGKEFV	1027.51	WD repeat and SOF domain-containing protein 1
Q6RT24	SALQNAESDRL	1203.597	Centromere-associated protein E
Q6VNB8	LASGNPAIV	841.478	WD repeat and FYVE domain-containing protein 3
Q6WKZ8	SLPTNLIHL	1007.589	E3 ubiquitin-protein ligase UBR2
Q6ZPV2	SGLLNPYSL	963.515	Putative DNA helicase INO80 complex homolog 1
Q7TMB8	SAPYGRITL	977.542	Cytoplasmic FMR1-interacting protein 1
Q7TN29	AQPGASGMLTPM	1160.544	Stromal membrane-associated protein 2
Q7TSA3	SQVINSHSV	970.496	B- and T-lymphocyte attenuator
Q80SU7	GMIENGPFL	977.477	Interferon-induced very large GTPase 1
Q80TG1	FSLENLRMT	1110.562	Uncharacterized protein KIAA1267
Q80TG1	FSLENLRMTNT	1325.652	Uncharacterized protein KIAA1267
Q80TH2	GSLKNVTTL	932.542	Protein LAP2
Q80U28	IAPTNAEVL	927.515	MAP kinase-activating death domain protein
Q80WJ6	MAALGPTVLI	985.576	Multidrug resistance-associated protein 9
Q8BG67	SAIINEDNL	988.495	Protein EFR3 homolog A
Q8BGF6	IVGINLTEM	989.534	ELMO domain-containing protein 2

Q8BHY8	IGPKNYEFL	1080.573	Sorting nexin-14
Q8BPS4	SALANYIHL	1001.542	Integral membrane protein GPR180
Q8BQM4	VSLLDIDHL	1024.568	HEAT repeat-containing protein 3
Q8BX02	GGPENTLVF	933.468	KN motif and ankyrin repeat domain-containing protein 2
Q8BX57	SSIQNFQKGTL	1222.643	PX domain-containing protein kinase-like protein
Q8BYZ1	YQVGNLAGHTL	1172.606	ABI gene family member 3
Q8C0L9	FGIHNGVETL	1086.558	Putative glycerophosphodiester phosphodiesterase 5
Q8C3J5	SMVQNRVFL	1093.583	Dedicator of cytokinesis protein 2
Q8C3J5	SQFPNAEKM	1051.488	Dedicator of cytokinesis protein 2
Q8C407	YAPANGDFTFV	1201.553	Protein YIPF4
Q8C4V1	MGILNTDTL	977.498	Rho GTPase-activating protein 24
Q8C9E8	MSMTNTHL	1063.455	Protein FAM26F
Q8CC15	MSAVNDEF	999.409	RING1 and YY1-binding protein
Q8CDD9	FSVTNPHTM	1033.478	Uncharacterized protein C1orf103 homolog
Q8CDJ3	SQHVNLQQL	1053.533	Uncharacterized protein KIAA0831
Q8CGP5	LAIRNDEEL	1072.564	Histone H2A type 1-F
Q8CJF7	TSVENHEFL	1075.506	AT-hook-containing transcription factor 1
Q8JZP2	FSELNLAAYVTGG	1341.669	Synapsin-3
Q8K1E0	ASMSNDFKSVL	1198.578	Syntaxin-5
Q8K3C0	NGPQNIYNL	1032.511	Ribonuclease kappa
Q8R081	YAADNQIYI	1070.516	Heterogeneous nuclear ribonucleoprotein L
Q8VE11	VGIENIHVM	1011.53	Myotubularin-related protein 6
Q8VIJ8	SAVKNLQQL	1000.579	UPF0171 protein C16orf35 homolog
Q91WG4	SAPRNFVENF	1180.575	Elongator complex protein 2
Q91WM3	AALLNTDLV	929.531	U3 small nucleolar RNA-interacting protein 2
Q91XF4	SAPVNGSVFI	990.526	E3 ubiquitin-protein ligase RNF167
Q91XU3	FAIDDHDYL	1108.495	Phosphatidylinositol-5-phosphate 4-kinase type-2 gamma
Q91Y74	GAVKNLTYF	1012.547	CMP-N-acetylneuraminase-beta-galactosamide-alpha-2,3-sialyltransferase
Q91YK2	SSPASTPLSPM	1074.514	Ribosomal RNA processing protein 1 homolog B
Q91YW3	SQLVKADEM	1020.504	DnaJ homolog subfamily C member 3
Q921M3	IGLQNGVLL	926.568	Splicing factor 3B subunit 3
Q922D8	AGILNGKLV	884.546	C-1-tetrahydrofolate synthase, cytoplasmic
Q99J94	LQVNGVANI	927.526	Solute carrier organic anion transporter family member 1A6
Q99K28	SSISHSVLSEM	1176.557	ADP-ribosylation factor GTPase-activating protein 2
Q99K90	SSLVNSQTL	948.5	Mitogen-activated protein kinase kinase kinase 7-interacting protein 2
Q99KD5	SGLQNFEAL	978.49	Protein unc-45 homolog A
Q99KN9	FSLMSTNTV	999.482	Clathrin interactor 1
Q99KV1	MAPQNLSTF	1008.482	DnaJ homolog subfamily B member 11
Q99LF4	ASPEGQDYL	979.437	UPF0027 protein C22orf28 homolog
Q99MY8	VGLINKDSV	944.542	Probable histone-lysine N-methyltransferase ASH1L
Q99NH0	ASVLNVNHI	966.537	Ankyrin repeat domain-containing protein 17
Q9CQU1	SAPTLEDHF	1016.469	Microfibrillar-associated protein 1
Q9CR64	SAIFNFQSL	1026.526	Transmembrane protein 167A
Q9CU65	YAPDSIYYL	1104.525	Zinc finger MYM-type protein 2
Q9CVI2	VAYMNPAM	1009.485	Protein FAM133B
Q9CXK4	RSVDNIQFL	1091.585	RAG1-activating protein 1
Q9D020	GALKNTDYF	1028.505	Cytosolic 5'-nucleotidase 3
Q9D0E1	GMGFGLERM	997.46	Heterogeneous nuclear ribonucleoprotein M
Q9D2L9	AGVSNIEF	949.5	Protein FAM111A
Q9D2N4	KVTLNGFLDTL	1220.689	Dystrobrevin alpha
Q9D3G9	YSVANHNSFL	1151.549	Rho-related GTP-binding protein RhoH
Q9D7I0	TGPPPYHESL	1097.527	Protein shisa-5
Q9D868	SSPVNPVVF	945.505	Peptidyl-prolyl cis-trans isomerase H
Q9D8P7	SGIIDSDFL	966.478	General transcription factor 3C polypeptide 6
Q9DB27	IGIENIHYL	1071.584	Malignant T cell amplified sequence 1
Q9DBN5	VGVNPNVFL	958.536	Peroxisomal Lon protease homolog 2
Q9DC50	IQLMNTAHL	1040.556	Peroxisomal carnitine O-octanoyltransferase
Q9DCN7	KSIVNQVFL	1047.62	RING finger and transmembrane domain-containing protein 1
Q9EQ32	YGLKNLTAL	992.578	Phosphoinositide 3-kinase adapter protein 1
Q9EQU3	LSHTNILVL	1009.605	Toll-like receptor 9

Q9ERA6	SAPVNFISA	905.473	Tuftelin-interacting protein 11
Q9ES56	FALKNPFYSL	1199.647	Trafficking protein particle complex subunit 4
Q9JHC9	SAPSAIALPV	925.536	ETS-related transcription factor Elf-2
Q9JI75	GAPSNPDVF	903.421	Ribosylidihydronicotinamide dehydrogenase [quinone]
Q9JJ28	AALKLGQEL	942.562	Protein flightless-1 homolog
Q9JKP8	VSSINQEAL	960.5	Chromatin accessibility complex protein 1
Q9JM73	YAPTSGLADGSLTV	1351.675	Serum response factor
Q9QWT9	GAPLNLDL	911.52	Kinesin-like protein KIFC1
Q9QXM0	KSPTAPPDLYF	1235.631	Abhydrolase domain-containing protein 2
Q9QXV3	LSPANQEIQ	928.474	Inhibitor of growth protein 1
Q9R190	YAPINANAI	946.5	Metastasis-associated protein MTA2
Q9WTK5	AALQNLEQL	999.548	Nuclear factor NF-kappa-B p100 subunit
Q9WTU0	LSVPNKDTV	972.537	PHD finger protein 2
Q9WTX2	ISPENHISL	1009.532	Interferon-inducible double stranded RNA-dependent protein kinase activator A
Q9Z1F9	SMAGNIIPAI	986.534	SUMO-activating enzyme subunit 2
Q9Z1T1	AAPQNFTPSMI	1176.572	AP-3 complex subunit beta-1
Q9Z2U4	FSPFNPTSL	1009.5	ETS-related transcription factor Elf-4

Supplemental Table 3. WT H2-K^b peptides.

Accession number	Peptide	mass-to-charge ratio	Protein entry name
A2APV2	LQYEFTKL	1041.562	Formin-like protein 2
O08575	TIIFHSL	943.562	Eyes absent homolog 2
O54692	STVEFTNL	910.452	Centromere/kinetochore protein zw10 homolog
O55013	SALIYSNL	880.478	Trafficking protein particle complex subunit 3
P01867	SVHTFPAL	871.468	Ig gamma-2B chain C region
P15066	ETPVYANL	906.457	Transcription factor jun-D
P21995	VAPGYPLL	829.482	Embigin
P23116	QSIEFSRL	979.521	Eukaryotic translation initiation factor 3 subunit A
P29351	AQYKFIYV	1031.557	Tyrosine-protein phosphatase non-receptor type 6
P32233	AAYEFTTL	915.446	Developmentally-regulated GTP-binding protein 1
P40201	RVLIFSQM	993.556	Chromodomain-helicase-DNA-binding protein 1
P40336	RSYDFEFM	1094.462	Vacuolar protein sorting-associated protein 26A
P42227	ATLVFHNL	914.51	Signal transducer and activator of transcription 3
P46978	AVLSFSTRL	993.573	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit STT3A
P47753	ISFKFDHL	1006.536	F-actin-capping protein subunit alpha-1
P54823	INDFPKL	993.541	Probable ATP-dependent RNA helicase DDX6
P56528	ANYEFSQV	957.432	ADP-ribosyl cyclase 1
P62082	VNFEFPEF	1028.473	40S ribosomal protein S7
P62245	VIVRFLTV	946.609	40S ribosomal protein S15a
P63082	SAMVFSAM	843.375	V-type proton ATPase 16 kDa proteolipid subunit
P63085	VGPRYTNL	919.5	Mitogen-activated protein kinase 1
P97481	SNYLFTKL	985.536	Endothelial PAS domain-containing protein 1
Q01237	SSFVFSKV	873.436	3-hydroxy-3-methylglutaryl-coenzyme A reductase
Q07076	ATRSFPQL	919.5	Annexin A7
Q3TAA7	SALRFLNL	933.552	Serine/threonine kinase 11-interacting protein
Q3TJZ6	ASPEFTKL	892.478	Protein FAM98A
Q3UWM4	SNPEFRQL	990.501	JmjC domain-containing histone demethylation protein 1D
Q5SWD9	RAYLFAHV	976.537	Pre-rRNA-processing protein TSR1 homolog
Q5SYH2	SQYVFTEM	1004.44	Transmembrane protein 199
Q60775	LVYQFKEM	1057.539	ETS-related transcription factor Elf-1
Q61107	STFVYNSM	948.414	Guanylate-binding protein 4
Q61471	ISYLYNKL	1013.567	Protein Tob1
Q61545	SNYSYPQV	957.432	RNA-binding protein EWS
Q62141	VFTEVANL	892.478	Paired amphipathic helix protein Sin3b
Q62425	VNVDYSKL	937.5	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 4
Q63844	VGPRYTQL	933.516	Mitogen-activated protein kinase 3
Q64343	VNIEFKDL	977.531	ATP-binding cassette sub-family G member 1
Q64475	SVYVYKVL	970.561	Histone H2B type 1-B
Q64693	SGPQFVQL	875.463	POU domain class 2-associating factor 1
Q689Z5	TAPEYVFL	939.483	Protein strawberry notch homolog 1
Q68FF0	IAVPFLKDAVS	1159.673	Uncharacterized protein KIAA1841
Q6GQT6	SGYDFSRL	944.448	Sterol regulatory element-binding protein cleavage-activating protein
Q6PJN8	TAPQYYRL	1011.526	DALR anticodon-binding domain-containing protein 3
Q6WKZ8	VAYKFPEL	966.53	E3 ubiquitin-protein ligase UBR2
Q71B07	SVVAFHNL	886.479	Protein dpy-19 homolog 3
Q76MZ3	VADKFTL	922.489	Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform
Q791N7	TSVVFNKL	907.525	DNA-directed RNA polymerase I subunit RPA12
Q7M6Y3	VAFDFTKV	926.499	Phosphatidylinositol-binding clathrin assembly protein
Q7TNB8	SAPEYVFL	925.467	Protein strawberry notch homolog 2
Q80SU7	RQYIFSKL	1054.605	Interferon-induced very large GTPase 1
Q80SU7	VNSIFQHL	957.516	Interferon-induced very large GTPase 1
Q8BMI0	SAFSFRTL	928.489	F-box only protein 38
Q8BU03	FAYRFSNL	1017.516	Periodic tryptophan protein 2 homolog
Q8BVK9	VNLREYPSL	1090.59	Sp110 nuclear body protein
Q8BW96	KIFEFKTEL	1154.646	Calcium/calmodulin-dependent protein kinase type 1D

Q8C4B4	HIYFEPQL	1046.531	Protein unc-119 homolog B
Q8C5N3	ASPIFTHV	871.468	Nucampholin homolog
Q8CD15	VVYIYHSL	993.541	Myc-induced nuclear antigen
Q8CDD8	INFDNFNTI	983.484	BTB/POZ domain-containing protein KCTD20
Q8CFI7	IGPTYYYQRL	1110.595	DNA-directed RNA polymerase II subunit RPB2
Q8CG47	AALDFKNV	877.478	Structural maintenance of chromosomes protein 4
Q8K2H4	INQIYEARV	1105.601	ARFGAP with coiled-coil, ANK repeat and PH domain-containing protein 1
Q8K3I9	SRVSFTSL	896.484	Glucocorticoid-induced transcript 1 protein
Q8K3W0	ATQVYPKL	919.525	Protein BRE
Q8K4Z5	RNYQDFDL	1102.532	Splicing factor 3 subunit 1
Q8QZX2	TSYRFLAL	970.536	Uncharacterized protein C4orf15 homolog
Q8VCP8	SGLKYVNV	879.494	Adenylate kinase isoenzyme 6
Q8VDD5	RVAEFTTNL	1050.558	Myosin-9
Q8VG04	TVPSFTAGSI	979.51	Olfactory receptor 478
Q91V92	SIANFTNV	865.442	ATP-citrate synthase
Q91VM3	SSPKFSEI	894.457	WD repeat domain phosphoinositide-interacting protein 4
Q91WT4	AIVEFATV	849.472	DnaJ homolog subfamily C member 17
Q920Q4	VSFTYRYL	1048.547	Vacuolar protein sorting-associated protein 16 homolog
Q922P9	AWIKVEQL	986.568	Nuclear protein NP60
Q924N4	SAARFALL	848.499	Solute carrier family 12 member 6
Q99KC8	AVYSFEAL	899.452	Loss of heterozygosity 11 chromosomal region 2 gene A protein homolog
Q99ME9	QILSDFPKL	1060.604	Nucleolar GTP-binding protein 1
Q99P81	SSYFFGKL	948.483	ATP-binding cassette sub-family G member 3
Q99PQ1	ISYQFSNL	971.484	Tripartite motif-containing protein 12
Q9CPV7	SVIKFENL	949.536	Probable palmitoyltransferase ZDHHC6
Q9CZM2	STYKFFEY	1020.504	60S ribosomal protein L15
Q9D0E1	GQLLFDPRM	1076.556	Heterogeneous nuclear ribonucleoprotein M
Q9D6T0	TSVRFTQL	951.526	Nitric oxide synthase-interacting protein
Q9D7G0	VSYLFSHV	951.494	Ribose-phosphate pyrophosphokinase 1
Q9D8E6	VNFVHTNL	943.5	60S ribosomal protein L4
Q9D902	SGYKFGVL	870.472	General transcription factor IIE subunit 2
Q9DBT5	VGYRYETL	1000.51	AMP deaminase 2
Q9DBZ5	VGITYQHI	930.505	Eukaryotic translation initiation factor 3 subunit K
Q9DCF9	VAFAYKNV	911.499	Translocon-associated protein subunit gamma
Q9EQ06	TAYEFAKL	942.494	Estradiol 17-beta-dehydrogenase 11
Q9ESC7	RAYLFNSV	969.516	Protein yippee-like 1
Q9ESG6	QSVNYSKL	938.495	P2Y purinoceptor 14
Q9JHI7	QTYDYRNI	1072.506	Exosome complex exonuclease RRP45
Q9JHI9	TGYAYTQGL	973.463	Solute carrier family 40 member 1
Q9JHU4	ASYEFVQRL	1112.574	Cytoplasmic dynein 1 heavy chain 1
Q9JHU9	SIVSYNHL	932.484	Inositol-3-phosphate synthase 1
Q9JL26	LQYEFTHL	1050.526	Formin-like protein 1
Q9JLV5	RSPEYLSL	964.51	Cullin-3
Q9QXB9	ASYEFTTL	931.441	Developmentally-regulated GTP-binding protein 2
Q9R1T2	HGYTFANL	922.442	SUMO-activating enzyme subunit 1
Q9WUR2	SSYTFPKM	960.45	Peroxisomal 3,2-trans-enoyl-CoA isomerase
Q9Z2C4	SAFEFNEL	956.437	Myotubularin-related protein 1
Q9Z2R9	SSIVFAEL	865.467	Eukaryotic translation initiation factor 2-alpha kinase 1

Supplemental Table 4. TKO H2-K^b peptides.

Accession number	Peptide	mass-to-charge ratio	Protein entry name
A2APV2	LQYEFTKL	1041.562	Formin-like protein 2
O54692	STVEFTNL	910.452	Centromere/kinetochore protein zw10 homolog
O55222	SGIDFKQL	907.489	Integrin-linked protein kinase
O70591	VIAGFNRL	889.526	Prefoldin subunit 2
O88653	QVVQFNRL	1003.569	Mitogen-activated protein kinase scaffold protein 1
O89053	VNPKFMAL	919.508	Coronin-1A
P01887	KTVYWDRDM	1213.568	Beta-2-microglobulin
P0C6F1	WIRQYPAL	1046.579	Dynein heavy chain 2, axonemal
P15066	ETPVYANL	906.457	Transcription factor jun-D
P15307	TTLIFQKL	963.588	C-Rel proto-oncogene protein
P21995	VAPGYPLL	829.482	Embigin
P26039	SNPEFSSV	866.39	Talin-1
P27641	RQYMFSSL	1031.498	ATP-dependent DNA helicase 2 subunit 2
P29351	AQYKFIYV	1031.557	Tyrosine-protein phosphatase non-receptor type 6
P29533	ISPEYKTI	950.52	Vascular cell adhesion protein 1
P32233	AAYEFTTL	915.446	Developmentally-regulated GTP-binding protein 1
P35980	KILTFDQL	977.567	60S ribosomal protein L18
P40201	RVLIFSQM	993.556	Chromodomain-helicase-DNA-binding protein 1
P40336	RSYDFEFM	1094.462	Vacuolar protein sorting-associated protein 26A
P42227	ATLVFHNL	914.51	Signal transducer and activator of transcription 3
P50396	SAFDENFM	960.377	Rab GDP dissociation inhibitor alpha
P54823	INFDFPKL	993.541	Probable ATP-dependent RNA helicase DDX6
P56528	ANYEFSQV	957.432	ADP-ribosyl cyclase 1
P63085	VGPRYTNL	919.5	Mitogen-activated protein kinase 1
P68369	ERPTYTNL	993.5	Tubulin alpha-1A chain
P97370	VGYRQPLV	931.537	Sodium/potassium-transporting ATPase subunit beta-3
P97479	TNLIYQQV	978.526	Myosin-VIIa
P97481	SNYLFTKL	985.536	Endothelial PAS domain-containing protein 1
Q01237	SSFVFSTV	873.436	3-hydroxy-3-methylglutaryl-coenzyme A reductase
Q02248	RTYTYEKL	1073.563	Catenin beta-1
Q08093	IGPDFQKGL	974.531	Calponin-2
Q08943	TQYTFSSI	946.452	FACT complex subunit SSRP1
Q09014	EIYEFHKM	1096.514	Neutrophil cytosol factor 1
Q3TEA8	VSQYYPKL	997.536	Heterochromatin protein 1-binding protein 3
Q3TGF2	NAPEFVKV	903.494	Protein FAM107B
Q3TJZ6	ASPEFTKL	892.478	Protein FAM98A
Q3TLH4	FQQEFPSL	995.484	BAT2 domain-containing protein 1
Q3UWM4	SNPEFRQL	990.501	JmjC domain-containing histone demethylation protein 1D
Q5SYH2	SQYVFTEM	1004.44	Transmembrane protein 199
Q61107	STFVYNSM	948.414	Guanylate-binding protein 4
Q61545	SNYSYPQV	957.432	RNA-binding protein EWS
Q62425	VNVDYSKL	937.5	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 4
Q64343	VNIEFKDL	977.531	ATP-binding cassette sub-family G member 1
Q64475	SVYVYKVL	970.561	Histone H2B type 1-B
Q64693	SGPQFVQL	875.463	POU domain class 2-associating factor 1
Q689Z5	TAPEYVFL	939.483	Protein strawberry notch homolog 1
Q68FL6	VSPLFQKL	931.562	Methionyl-tRNA synthetase, cytoplasmic
Q6GQT6	SGYDFSRL	944.448	Sterol regulatory element-binding protein cleavage-activating protein
Q6NSR3	SGPTYIKL	878.499	Uncharacterized aarF domain-containing protein kinase 2
Q6PA06	TNPSFDGRL	1006.496	Atlastin-2
Q6PCN7	SGFVFTRL	926.51	Helicase-like transcription factor
Q6ZQH8	VAPSFQTL	791.43	Nucleoporin NUP188 homolog
Q71B07	SVVAFHNL	886.479	Protein dpy-19 homolog 3
Q76LS9	VNVRFTGV	891.505	Protein FAM63A
Q76MZ3	VADKFTLE	922.489	Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform
Q7M6Y3	VAFDFTKV	926.499	Phosphatidylinositol-binding clathrin assembly protein

Q7TMW6	VAYGFRNI	939.505	Nuclear prelamin A recognition factor-like protein
Q7TNB8	SAPEYVFL	925.467	Protein strawberry notch homolog 2
Q80SU7	VNSIFQHL	957.516	Interferon-induced very large GTPase 1
Q80TM9	TNQDFIQR	1134.591	Nischarin
Q80VD1	SSPEFSEL	895.405	Protein FAM98B
Q80W47	SGYKFFSL	948.483	WD repeat domain phosphoinositide-interacting protein 2
Q80XH2	LEQRFLLE	1047.573	Interphotoreceptor matrix proteoglycan 2
Q8BGF7	KNYDFAQVL	1097.563	PAB-dependent poly(A)-specific ribonuclease subunit 2
Q8BJW5	IAVSFREL	934.536	Nucleolar protein 11
Q8BLB7	ITPPGYSHV	970.5	Lethal(3)malignant brain tumor-like 3 protein
Q8BLR9	TNLVYPAL	890.499	Hypoxia-inducible factor 1-alpha inhibitor
Q8BNA6	LNRNFTSL	964.522	Protocadherin Fat 3
Q8BXZ1	VVPEYVTL	919.514	Protein disulfide-isomerase TXNDC10
Q8C4B4	HIYEFPQL	1046.531	Protein unc-119 homolog B
Q8C570	VIYPMAVV	891.501	mRNA export factor
Q8C5N3	ASPIFTHV	871.468	Nucampholin homolog
Q8CEC6	KVLEFERV	1019.589	Peptidylprolyl isomerase domain and WD repeat-containing protein 1
Q8CFB4	STFVYNTM	962.429	Guanylate-binding protein 5
Q8CG47	AALDFKNV	877.478	Structural maintenance of chromosomes protein 4
Q8K0L2	SVYTHSYL	969.468	Ectonucleoside triphosphate diphosphohydrolase 8
Q8K2X8	VIAELVNV	856.514	General transcription factor IIH subunit 5
Q8K3B1	RGYEFGLV	940.489	F-box/SPRY domain-containing protein 1
Q8K3W0	ATQVYPKL	919.525	Protein BRE
Q8K4Z5	RNYQDFDL	1102.532	Splicing factor 3 subunit 1
Q8VCP8	SGLKYVNV	879.494	Adenylate kinase isoenzyme 6
Q91V92	SIANFTNV	865.442	ATP-citrate synthase
Q91VM3	SSPKFSEI	894.457	WD repeat domain phosphoinositide-interacting protein 4
Q920Q4	VSFTYRYL	1048.547	Vacuolar protein sorting-associated protein 16 homolog
Q922P9	AWIKVEQL	986.568	Nuclear protein NP60
Q924N4	SAARFALL	848.499	Solute carrier family 12 member 6
Q99JY9	STPEFYQV	970.452	Actin-related protein 3
Q99KH8	ISPLFAEL	889.504	Serine/threonine-protein kinase 24
Q99P81	SSYFFGKL	948.483	ATP-binding cassette sub-family G member 3
Q9CPV7	SVIKFENL	949.536	Probable palmitoyltransferase ZDHHC6
Q9CR47	SSPLYTTL	881.462	Ribosome biogenesis protein NSA2 homolog
Q9CX84	TSPTYRSL	924.479	Regulator of G-protein signaling 19
Q9CZM2	STYKFFEVE	1020.504	60S ribosomal protein L15
Q9D6T0	TSVRFTQL	951.526	Nitric oxide synthase-interacting protein
Q9D6Y4	SSVYFRSV	944.484	UPF0402 protein
Q9D7G0	VSYLFSHV	951.494	Ribose-phosphate pyrophosphokinase 1
Q9D8E6	VNFVHTNL	943.5	60S ribosomal protein L4
Q9DBU3	SNHVFNAL	901.453	Serine/threonine-protein kinase RIO3
Q9ESC7	RAYLFNSV	969.516	Protein yippee-like 1
Q9JHU4	ASYEFVQRL	1112.574	Cytoplasmic dynein 1 heavy chain 1
Q9JL26	LQYEFTHL	1050.526	Formin-like protein 1
Q9JLV5	RSPEYLSL	964.51	Cullin-3
Q9QXB9	ASYEFTTL	931.441	Developmentally-regulated GTP-binding protein 2
Q9QXK3	ATYIFNGL	898.467	Coatomer subunit gamma-2
Q9WU28	SMYVPGKL	894.476	Prefoldin subunit 5
Q9Z2C4	SAFEFNEL	956.437	Myotubularin-related protein 1
Q9Z2R9	SSIVFAEL	865.467	Eukaryotic translation initiation factor 2-alpha kinase 1