

SUPPLEMENTAL MATERIALS

SUPPLEMENTAL METHODS

Experimental Design. The workflow of the study: 1) equal number of male and female mice were used in each genotype group for glycopeptide isolation (n=8/group); 2) peptides were analyzed by LC-MS/MS and quantified by label-free quantification method using peak area; and 3) protein targets were validated by immunoblotting and cleavage assays.

Tissue samples and protein extraction. The LV infarct (LVI) region was collected at 0, 1, 3, 5, and 7 days post-MI as described previously, and the LV tissue was homogenized sequentially in phosphate buffered saline (PBS; 16 μ L per mg LV wet weight) with 1x protease inhibitors (Roche, Basel, Switzerland) to remove the soluble proteins and then in Reagent 4 (16 μ L per mg LV wet weight; Sigma, St. Louis, MO) with 1x protease inhibitors for the insoluble proteins.^{1, 2} Because the insoluble fraction is enriched for ECM, we used that fraction for the glycoproteomic analysis.

Immunoblotting also used the insoluble fraction for confirmation of glycoproteomic findings.

Trypsin digestion. Total protein from the insoluble fraction (1 mg) was denatured and reduced by adding 8 M urea and 12 mM Tris (2-carboxyethyl) phosphine hydrochloride (TCEP) in 1 M ammonium bicarbonate and incubating at 37°C for 1 h. The samples were alkylated with 16 mM iodoacetamide at room temperature in the dark for 30 min. The samples were diluted 5-fold with water prior to the addition of trypsin (Promega, Madison, WI), which was added at a ratio of 1:50 (w/w, enzyme:protein). The samples were digested at 37°C overnight with gentle shaking. The samples were centrifuged to

remove precipitate. Peptides were cleaned by Sep-Pak Vac C18 cartridge (Waters, Milford, MA). Peptide concentration was determined by BCA assay (Thermo Fisher Scientific, Rochford, IL).

***N*-Linked glycopeptide capture.** *N*-linked glycopeptides were isolated from the tryptic peptides using the solid phase extraction of glycopeptides (SPEG) method. Briefly, 0.8 mg of peptides was oxidized by 10 mM sodium periodate (Bio-Rad, Hercules, CA) at room temperature for 1 h. Glycopeptides were covalently conjugated to a solid support via hydrazide chemistry (Bio-Rad, Hercules, CA), with incubation at room temperature overnight. The hydrazide beads were washed with 1.5 M NaCl, and water prior to release of formerly *N*-linked glycopeptides from solid support by PNGase F (New England Biolabs, Ipswich, MA) at 37°C overnight. The eluent was purified by Sep-Pak Vac C18 cartridge (Waters, Milford, MA) and resuspended in 20 μ L of 0.4% acetic acid.

Mass spectrometry analysis. For the RefSeq database search, the precursor mass tolerance and fragment mass tolerance were set at 15 ppm and 0.05 Da, respectively. Trypsin was specified as the protease. The fixed modification was set as carbamidomethylation (C), and other modifications were set as flexible modification as follows: deamidation (N) and oxidation (M). Full-tryptic end and two missed cleavage sites were allowed. A decoy version of the RefSeq mouse database was used to estimate peptide and protein false discovery rate. The average specificity of the glycopeptide isolation was ~92%, indicating that ~8% of the total identified peptides were non-glycopeptides. The non-glycosylated peptides were removed from the list. To assess the reproducibility of the quantification, one sample was analyzed twice as a technical replicate. **Supplemental Figure S1B** shows that the technical replicate had

good reproducibility ($R^2=0.991$, $p<0.0001$). We confirmed glycosylation for fibronectin, γ -sarcoglycan, and periostin (**Supplemental Figure S2**). A total of 243 proteins (45%) were identified as having two or more glycopeptides, whereas 298 (55%) were identified as having one unique glycopeptide. The majority (92%, 278 of 298 single glycopeptide identifications) were identified at least twice (the peptide spectra matched ≥ 2). For the 20 single glycopeptides identified only once, the annotated MS/MS spectra are provided in **Supplemental Figure S3**. A total of 35% of the *N*-linked glycoproteome fell in the extracellular region gene ontology (GO) category, while 33% in the plasma membrane and 10% in the cell surface GO categories (**Supplemental Figure S1C** and **Supplemental Table S4**). Taking into account nonexclusive localization in GO, 78% of the *N*-glycoproteome was located outside the plasma membrane, indicating the glycopeptide isolation strategy was successfully enriched for extracellular proteins.

LC-MS quantification. Peptides were quantified by label-free relative quantification based on integrated peptide peak intensities using the SIEVE software, version 2.1 (Thermo Fisher Scientific, San Jose, CA). Frame parameters were set as an RT width of 2.5 min and an MZ width of 6 ppm, with intensity threshold of 10^6 . The peak intensity was normalized to Total Ion Current (TIC) by SIEVE. A frame abundance ratio was calculated as the ratio of the average integrated intensity of the eight null samples to the average integrated intensity of the eight WT samples. The significance of the difference between 8 WT and 8 null for each frame was calculated using the Student's t-test. When Bonferroni multiple testing correction was applied, the α was set at 4.1×10^{-4} . Frames were identified by importing Proteome Discoverer searched files. The false discovery rate was calculated as the ratio of changed proteins in 8000 permutation of

the genotype groups against that in the right genotype groups. Unsupervised clustering was performed using normalized peak areas of the identified glycopeptides.

Immunoblot analysis. Total protein (10 µg) was separated on 4-12% Criterion™ XT Bis-Tris gels (Bio-Rad), transferred to a nitrocellulose membrane (Bio-Rad), and stained with MemCode™ Reversible Protein Stain Kit (Thermo Scientific) to verify protein concentration and loading accuracy. After blocking with 5% nonfat milk (Bio-Rad), the membrane was probed with primary antibodies: rabbit anti-CD36 polyclonal antibody (Novus Biologicals NB400-144) at 1:1000, goat anti-CILP antibody (Aviva Systems Biology, OAEB01146) at 1:1000, or rabbit anti-caspase-3 (Cell Signaling, 9662) at 1:1000 followed by secondary antibody (Santa Cruz, SC2020, 1:5000), and detected with ECL Prime Western Blotting Detection Substrate (Amersham).

RT-PCR analysis. RNA extraction was performed on the LVI tissue using PureLink RNA Mini Kit (Invitrogen, 12183-018A). RNA levels were quantified using the NanoDrop ND-1000 Spectrophotometer (Thermo Scientific). Reverse transcription of equal RNA content (30 ng) was performed using the High Capacity RNA-to-cDNA Kit (Life Technologies 4837406). CILP, CD36, *Ltbp2*, *Col6a6*, *Col6a1*, *Lama5*, and *Fbln1* gene expression levels were assessed using specific primers (CILP, Mm00557687_m1; CD36, Mm01135198_m1; *Ltbp2*, Mm01307379_m1; *Col6a6*, Mm00556810_m1; *Col6a1*, Mm00487160_m1; *Lama5*, Mm01222029_m1; and *Fbln1*, Mm00515705_m1). All values were normalized to hypoxanthine guanine phosphoribosyl transferase 1 (*Hprt1*, Mm01545399_m1) housekeeping gene. The experiments were performed according to the MIQE guidelines with one exception. *Hprt1*, was the only reference

gene showing no change in expression (Gusb, Hsp90ab1, Actb and Gapdh are all significantly changed post-MI).³

***In vitro* cleavage assay.** Mouse CD36 recombinant protein (R&D Systems, Minneapolis, MN) was incubated with active MMP-2 (R&D, Minneapolis, MN), MMP-9 (Calbiochem/Millipore, Darmstadt, Germany), or MMP-12 (Enzo Life Science, Framingdale, NY) recombinant protein at a ratio of 2:1 in 1X zymogram developing buffer (Bio-Rad, Hercules, CA). The recombinant protein/MMP mixtures were incubated at 37 °C for 24 h. Two negative controls, MMP alone or recombinant protein alone, were included and went through the same procedure. Samples were run on an SDS-PAGE, followed by silver staining (GEHealthcare, 17-115-001).

Immunofluorescence or immunohistochemistry. For histological analysis, the middle section (mid-papillary region) from day 7 post-MI LVs were embedded in paraffin and sectioned at 5 µm. Immunofluorescence or immunohistochemistry was performed using anti-rabbit CD36 antibody (Novus Biological NV400-144; 1:100), anti-mouse Mac3 Antibody (Cedarlane CL8943AP; 1:100), anti-mouse neutrophils (Cedarlane; CL8993AP; 1:100) and terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL; Roche Diagnostics; 11684809910). Blocking was performed in goat serum (Vector Laboratories, PK-6101) and secondary antibodies used were Alexa Fluor 488 conjugate (Invitrogen, S32354) and Alexa Fluor 546 conjugate (Invitrogen, S11225). For CD36 and Mac-3 staining, slides were first blocked for 20 min. After blocking, slides were incubated overnight in anti-rabbit CD36 followed by 30 min incubation in streptavidin and Alexa Fluor 488. Slides were then incubated overnight in anti-mouse Mac3 to stain for macrophages. Afterwards streptavidin and Alexa Fluor 546 were

applied and slides were incubated for 30 min. For TUNEL and neutrophil dual immunofluorescence, TUNEL reaction mixture was added and slides were incubated for 60 min at 37 °C. After TUNEL incubation period, neutrophil antibody was added and slides were incubated overnight. Alexa Fluor 546 was added to slides and incubated for 1 h. For neutrophil detection, HistoMark Black (KPL 54-75-00) was used to visualize positive staining, with eosin as a counterstain. Negative controls were incubated with no primary antibody. To quantify staining, five random images were captured 40x magnification. Quantification was measured by Image-Pro Plus version 6.2. Representative images are shown at 60x magnification.

Phagocytosis Assay. LVI tissue was dissociated into single-cell suspension using 600 U/mL collagenase type II (Worthington Biochemicals, CLS-2) and 60 U/mL DNase1 (AppliChem, A3778.0500). Cells were washed and resuspended in cold PBS supplemented with 0.5% bovine serum albumin (BSA) and 2 mM Ethylenediamine-tetraacetic acid (EDTA). Cells were sequentially incubated with Ly-6G microbeads (Miltenyi Biotec, 130-092-332) to remove neutrophils, and with CD11b microbeads (Miltenyi Biotec, 130-049-601) to isolate macrophages. Positive cells were isolated using magnetic MS columns (Miltenyi Biotec, 130-042-201), and cell number was adjusted to 10^6 /mL using Dulbecco's Modified Eagle's medium (DMEM) + 10% fetal bovine serum (FBS). Cell suspensions (100 uL per well) were cultured overnight. Cells were incubated with 1 ng/uL of active MMP-9 (Calbiochem/Millipore, Darmstadt, Germany), CD36 blocking peptide (CD36i; Calbiochem/Millipore, Darmstadt, Germany), or a 1:1 mixture of MMP-9 and CD36i for 3 hours. Cells incubated with fresh media were used as the unstimulated negative controls. The cells were incubated with

fluorescent BioParticle suspension (100 μ L) for 2 h, then incubated in Trypan Blue for 1 min. Quantification was measured by SpectraMax M3 Plate Reader (excitation: 480 nm; emission: 520 nm). Representative images are shown at 40X.

Blood neutrophil isolation and stimulation. Briefly, blood was collected in heparinized tubes from the common carotid arteries of 5 mice and pooled, and neutrophils were separated by density gradient centrifugation at 250 \times g for 35 min using lympholyte poly cell separating media (Cedarlane, CL5070) followed by hypotonic lysis of erythrocytes using red cell lysis buffer (Miltenyi biotec). A single cell suspension was achieved with pre-separation filters (Miltenyi Biotec 130-041-407, 30 μ m) and the cellular pellet resuspended in PEB buffer (PBS containing 0.5% BSA and 2 mM EDTA). The cell suspension was serially incubated with anti-Ly-6G MicroBead Kit mouse (10 min, Miltenyi Biotec, 130-092-332) and CD11b MicroBeads mouse/human (Miltenyi Biotec, 130-049-601) and isolated using a MiniMACS magnetic separator column. Ly-6G+ neutrophils was resuspended in 1 mL of RPMI 1640 media and plated in a 6-well plate (1.5×10^5 cells/well). The neutrophils were treated with 0.5 ng/uL of active MMP-9 (Calbiochem/Millipore, Darmstadt, Germany) or CD36 blocking peptide (CD36i; Calbiochem/Millipore, Darmstadt, Germany), and incubated at 37°C for 3 h. Cells incubated with fresh media were used as the unstimulated negative controls. Cells were harvested for RNA isolation and RT-PCR was performed. Casp3, Casp9, Bax, and Xiap gene expression levels were assessed using specific primers (Caspase 3, Mm01195085_m1; Caspase 9, Mm00516563_m1; Bax, Mm00432051_m1; and Xiap, Mm01311594_mH). The gene levels were normalized to Hprt1 and expressed as $2^{-\Delta Ct}$ values \pm SEM.

SUPPLEMENTAL REFERENCES

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2. de Castro Bras LE, Ramirez TA, DeLeon-Pennell KY, Chiao YA, Ma Y, Dai Q, et al. Texas 3-step decellularization protocol: Looking at the cardiac extracellular matrix. *J Proteomics.* 2013;86:43-52.
3. Lindsey ML, Iyer RP, Zamilpa R, Yabluchanskiy A, DeLeon-Pennell KY, Hall ME, et al. A novel collagen matricryptin reduces left ventricular dilation post-myocardial infarction by promoting scar formation and angiogenesis. *J Am Coll Cardiol.* 2015;66:1364-1374.

SUPPLEMENTAL TABLES

Supplemental Table S1. Animal numbers used for study.

	WT					MMP-9 null				
	D0	D1	D3	D5	D7	D0	D1	D3	D5	D7
Proteomics	8	----	----	----	8	8	----	----	----	8
Immunoblotting & immunohistochemistry	8	8	8	8	8	8	8	8	8	8
Phagocytosis & apoptosis	5	----	----	----	5	5	----	----	----	5

Supplemental Table S2. A total of 1161 unique N-linked glycopeptides were quantified by LC-MS, with a 1% false discovery rate, and these sites represented 541 unique glycoproteins.

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
34328417	Sarcalumenin	2	VYGALFWSLAPLINVTEPPR	Deamidated(14)	4.18	3	748.7
27734196	Cartilage intermediate layer protein	2	EQRPGQNCNSNYTVR	Carbamidomethyl(8)Deamidated(7)	3.17	3	570.6
568916058	Sialoadhesin	2	MNPAGPVLENETVTLICSTPK	Carbamidomethyl(17)Deamidated(10)	4.82	2	1144.6
568933000	Platelet glycoprotein 4	5	QFWIFDVQNPDDVAKNSSK	Oxidation(1)	5.94	3	747.0
568933000	Platelet glycoprotein 4	5	RPYIVPILWLNETGTIGDEK	Deamidated(11)	5.81	3	772.4
568986620	Clusterin	3	SGSGLVGQQLLEEFLNQSSPFYFWMNGDR	Deamidated(15)Deamidated(25)Oxidation(24)	3.81	3	1070.8
158341636	latent-transforming growth factor beta-binding protein 2	1	DSSPQAAHVNHLSPPWGLNLTEK	Deamidated(19)	5.03	4	625.6
6753138	Sodium/potassium-transporting ATPase subunit	4	LDWLGNCGLNDDSYGYR	Carbamidomethyl(7)Deamidated(6)	4.13	2	1053.4
156616286	Collagen alpha-6(VI) chain	11	LNANLLSSLWDTFQNK	Deamidated(15)	4.82	2	933.0
161016843	Desmoglein-2	4	NTGELNITSILDR	Deamidated(6)	2.73	2	723.9
568924429	Ceramide synthase 2	1	LWLVPVNLTWADLEDKDGR	Deamidated(6)	4.79	3	714.7
6753484	Collagen alpha-1(VI) chain	5	RNFTAADWGHRS	Deamidated(2)	3.99	3	473.6
568920137	Laminin subunit alpha-5	15	EQLQGINASSAAWAR	Deamidated(7)	3.39	2	801.9
160333372	Lumican	5	AFENVTDLQWLILDHNLLENSK	Deamidated(4)	5.41	3	871.8
61651673	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit STT3B	1	TTLVDNNTWNNSHIALVGK	Deamidated(10)	3.72	3	700.0
568947434	Aminopeptidase N	9	SGQEDHYWLDVEKNQSAK	Deamidated(14)	3.59	3	712.3
594542525	Angiopoietin-1 receptor	1	VLPEPLHAPNVIDTGHNFAIINISSEPYFGDGPIK	Deamidated(22)	4.98	4	944.0
27370240	Leucyl-cystinyl aminopeptidase	8	VNSNMTGYYIVHYAHDDWTALINQLK	Deamidated(4)Oxidation(5)	6.88	4	771.6
170784829	Procollagen galactosyltransferase 1	2	TALWVATDHNTDNTSAILR	Deamidated(13)	5.4	3	700.7
238637279	4F2 cell-surface antigen heavy chain	1	APLMPWNESSIFHIPRPVSLNMTVK	Deamidated(7)Deamidated(21)Oxidation(4)Oxidation(22)	3.66	4	725.4
755498697	Fibrillin-1	5	AWGTPCELCPVNTSEYK	Carbamidomethyl(6)Carbamidomethyl(9)Deamidated(13)	3.25	2	1050.5
568911077	Nicastrin	4	ANNSWFQSILK	Deamidated(2)	3.44	2	654.8
6680840	Calumenin	2	GHDLNEDGLVSWEEYKNATYGYVLLDDPDPDDGFNYK	Deamidated(17)	5.36	4	1038.7
172072617	Peptidyl-prolyl cis-trans isomerase FKBP9	3	YHYNASLLDGTLLDSTWNLGK	Deamidated(4)	5.16	3	794.7
755537649	Platelet endothelial cell adhesion molecule	8	EKEDRPFHQAVVNDTQAFWHNK	Deamidated(13)	6.74	5	540.3

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2244.2	74.7	20	6.58E+02	4.88E+03	5.81E+02	0.00E+00	3.22E+03	4.60E+03	2.18E+02	8.71E+03	5.62E+02	1.67E+02	0.00E+00
1709.8	19.9	5	1.05E+04	9.00E+02	2.33E+04	0.00E+00	2.93E+04	0.00E+00	1.21E+04	1.16E+04	1.78E+03	6.98E+04	1.30E+05
2288.1	52.1	22	2.39E+04	5.69E+03	5.39E+04	1.16E+04	3.74E+04	3.34E+04	3.46E+03	2.58E+04	8.53E+04	5.52E+04	1.66E+06
2239.1	52.3	11	3.46E+04	5.50E+04	0.00E+00	2.85E+05	0.00E+00	0.00E+00	2.45E+04	1.76E+04	1.91E+05	8.73E+05	2.67E+05
2315.2	57.9	2	1.89E+04	3.55E+03	1.30E+04	1.04E+05	8.39E+04	4.48E+04	7.65E+03	4.79E+03	1.62E+05	1.21E+05	8.94E+04
3210.4	73.7	25	1.14E+04	1.33E+05	0.00E+00	1.22E+05	0.00E+00	7.54E+03	5.83E+03	2.61E+04	5.54E+04	9.41E+04	2.04E+04
2499.2	42.2	10	2.08E+04	6.90E+03	0.00E+00	1.09E+05	6.75E+03	0.00E+00	0.00E+00	4.15E+03	5.43E+04	1.55E+05	1.93E+04
2105.9	50.7	6	4.21E+03	0.00E+00	5.92E+03	2.92E+04	1.35E+04	1.40E+04	0.00E+00	0.00E+00	4.09E+04	7.01E+04	2.77E+04
1864.9	67.3	14	9.98E+03	2.29E+04	7.57E+03	5.97E+04	4.87E+03	0.00E+00	1.39E+04	2.39E+04	4.81E+04	8.32E+04	6.76E+04
1446.7	53.3	17	1.18E+05	1.53E+05	2.83E+05	1.03E+05	4.84E+05	4.70E+05	1.19E+05	2.55E+05	3.86E+05	2.85E+05	7.21E+06
2142.1	63.0	6	4.95E+03	3.35E+04	0.00E+00	6.16E+04	0.00E+00	1.13E+03	2.69E+03	1.53E+04	2.00E+04	4.87E+04	4.07E+04
1418.7	25.5	10	6.88E+04	1.99E+04	2.75E+04	8.47E+03	1.03E+05	8.14E+04	2.80E+04	3.96E+04	1.42E+05	2.16E+05	2.95E+04
1602.8	38.4	2	1.91E+03	5.30E+03	5.27E+03	2.08E+04	2.02E+04	2.83E+04	1.46E+04	5.31E+03	2.12E+04	5.91E+04	4.26E+03
2613.3	64.8	12	1.25E+04	4.15E+04	2.94E+04	1.19E+05	7.01E+04	6.32E+04	1.06E+04	4.39E+04	2.13E+04	2.13E+05	5.10E+04
2098.1	41.3	7	1.94E+04	8.99E+03	2.47E+03	9.82E+04	3.02E+03	8.98E+03	3.71E+03	4.24E+03	8.39E+04	1.05E+05	9.22E+03
2135.0	31.0	3	1.20E+04	6.95E+03	0.00E+00	5.08E+04	1.25E+04	2.96E+03	5.05E+03	0.00E+00	4.52E+04	4.10E+04	9.52E+03
3772.9	57.4	3	3.03E+04	1.88E+04	3.93E+04	2.49E+04	2.43E+04	3.35E+04	1.26E+03	4.64E+04	3.95E+04	1.75E+04	4.03E+05
3083.5	57.7	3	6.65E+03	4.03E+04	2.55E+03	2.96E+04	5.98E+03	5.69E+03	1.61E+03	2.57E+04	3.28E+04	3.30E+04	1.96E+04
2100.0	42.0	7	3.27E+04	8.99E+03	9.01E+03	1.44E+05	1.56E+04	3.20E+04	7.55E+03	1.13E+04	9.41E+04	1.48E+05	3.07E+04
2898.5	52.0	2	2.33E+04	2.35E+04	4.89E+03	4.63E+04	1.75E+04	0.00E+00	3.90E+03	6.04E+03	6.02E+04	3.23E+04	1.07E+05
2099.9	41.8	9	2.48E+04	5.86E+03	2.16E+04	1.67E+05	7.76E+04	7.61E+04	1.19E+04	7.88E+03	9.91E+04	1.65E+05	3.88E+04
1308.7	53.0	1	6.25E+03	1.62E+04	1.50E+03	4.07E+04	8.54E+03	8.34E+03	8.07E+03	1.50E+04	3.44E+04	5.29E+04	3.34E+04
4151.8	54.4	5	0.00E+00	8.29E+04	0.00E+00	6.85E+04	2.05E+04	2.02E+04	2.93E+03	3.90E+04	3.16E+04	5.86E+04	7.79E+04
2382.2	58.6	3	8.70E+03	2.50E+04	2.34E+03	6.88E+04	5.91E+03	4.84E+03	4.28E+03	2.67E+03	3.92E+04	1.94E+04	1.68E+04
2697.3	33.7	3	2.40E+04	5.66E+03	3.90E+03	4.12E+04	1.30E+04	1.12E+04	1.26E+04	9.51E+03	6.68E+04	6.30E+04	4.79E+04

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
3.48E+02	1.49E+02	0.00E+00	3.96E+05	8.63E+04	6.02E+03	23.50	8.02E+01	2.71E-01	24.80	8.92E+01	2.75E-01	1.63E+03	4.03E+04
5.67E+04	1.09E+05	7.54E+04	9.58E+04	1.21E+05	1.04E+05	9.60	1.29E+01	1.10E-05	13.13	1.51E+01	9.90E-07	5.39E+03	7.07E+04
5.56E+04	5.01E+04	1.34E+05	7.91E+04	1.15E+05	3.74E+04	8.79	2.54E+01	2.62E-01	9.42	3.04E+01	2.52E-01	2.11E+04	1.99E+05
7.47E+05	2.54E+05	3.37E+05	1.70E+06	2.27E+05	0.00E+00	8.15	2.03E+01	4.11E-02	9.35	2.30E+01	2.93E-02	4.59E+04	4.29E+05
3.12E+05	3.85E+05	3.38E+05	1.38E+06	2.42E+05	1.14E+04	7.31	1.71E+01	8.24E-02	7.93	2.08E+01	5.66E-02	3.34E+04	2.65E+05
2.64E+05	1.06E+05	7.72E+04	1.36E+06	2.33E+05	4.68E+04	6.86	2.01E+01	1.81E-01	7.62	2.09E+01	1.47E-01	2.57E+04	1.96E+05
1.34E+05	2.15E+05	9.76E+04	3.45E+05	1.02E+05	0.00E+00	5.95	1.47E+01	2.52E-02	7.12	1.66E+01	1.55E-02	1.45E+04	1.03E+05
4.32E+04	9.34E+04	9.56E+04	1.77E+05	7.34E+04	0.00E+00	6.06	1.18E+01	1.49E-02	6.74	1.53E+01	8.58E-03	8.20E+03	5.53E+04
1.19E+05	8.97E+04	7.39E+04	4.43E+05	9.30E+04	2.06E+04	5.83	1.18E+01	6.46E-02	6.37	1.30E+01	4.00E-02	1.44E+04	9.16E+04
3.05E+05	2.55E+05	4.38E+05	3.99E+05	3.80E+05	3.21E+05	4.55	1.19E+01	3.13E-01	5.42	1.44E+01	2.85E-01	1.61E+05	8.72E+05
7.79E+04	3.61E+04	3.28E+04	2.82E+05	3.70E+04	3.40E+03	4.51	1.17E+01	1.29E-01	5.30	1.22E+01	8.31E-02	9.77E+03	5.17E+04
1.89E+05	2.87E+05	2.66E+05	8.78E+05	2.51E+05	1.93E+04	4.63	8.21E+00	6.30E-02	5.25	1.04E+01	3.71E-02	3.81E+04	2.00E+05
4.92E+04	6.83E+04	4.34E+04	1.84E+05	2.63E+04	0.00E+00	3.98	7.00E+00	8.86E-02	5.09	8.84E+00	4.82E-02	8.16E+03	4.16E+04
1.31E+05	9.74E+04	4.29E+04	6.74E+05	7.04E+04	4.02E+04	3.61	7.39E+00	1.61E-01	4.83	8.73E+00	9.72E-02	2.56E+04	1.23E+05
8.62E+04	1.80E+05	9.95E+04	3.12E+05	1.18E+05	0.00E+00	4.40	1.02E+01	4.31E-02	4.81	1.16E+01	2.68E-02	1.80E+04	8.63E+04
3.52E+04	1.08E+05	6.61E+04	2.09E+05	4.91E+04	7.51E+02	4.31	9.98E+00	7.71E-02	4.79	1.17E+01	5.10E-02	1.01E+04	4.86E+04
3.03E+04	9.99E+04	1.23E+05	1.14E+05	1.18E+05	3.92E+04	4.12	6.21E+00	7.87E-02	4.73	7.95E+00	6.50E-02	1.82E+04	8.61E+04
4.38E+04	4.51E+04	5.11E+04	2.68E+05	1.15E+05	1.10E+04	4.37	9.00E+00	1.03E-01	4.57	9.51E+00	7.32E-02	1.15E+04	5.25E+04
1.25E+05	1.77E+05	1.31E+05	4.10E+05	1.31E+05	1.45E+04	3.69	7.53E+00	4.49E-02	4.34	8.90E+00	2.28E-02	2.56E+04	1.11E+05
4.35E+04	8.38E+04	7.70E+04	2.35E+05	7.76E+04	1.57E+04	4.08	7.39E+00	3.46E-02	4.33	8.83E+00	1.99E-02	1.42E+04	6.15E+04
1.02E+05	3.61E+05	1.65E+05	4.77E+05	1.72E+05	0.00E+00	3.39	6.32E+00	5.80E-02	4.29	8.10E+00	3.23E-02	3.28E+04	1.41E+05
7.30E+04	4.39E+04	3.84E+04	1.68E+05	3.55E+04	1.40E+03	3.61	6.33E+00	5.64E-02	4.14	7.65E+00	3.18E-02	1.03E+04	4.26E+04
7.59E+04	1.03E+05	9.53E+04	3.59E+05	5.58E+04	0.00E+00	3.50	7.18E+00	9.94E-02	4.13	7.94E+00	5.48E-02	1.86E+04	7.68E+04
5.85E+04	7.35E+04	3.94E+04	2.86E+05	2.32E+04	5.40E+03	3.63	9.74E+00	1.96E-01	4.13	1.06E+01	1.41E-01	1.16E+04	4.79E+04
5.93E+04	8.87E+04	8.84E+04	2.01E+05	8.37E+04	3.56E+03	3.81	6.48E+00	2.27E-02	4.10	8.28E+00	1.20E-02	1.46E+04	5.99E+04

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568939471	Serum paraoxonase/arylesterase 1	2	HANWTLTPLK	Deamidated(3)	3.13	2	591.3
568926396	Tenascin	12	ASTEEVPSLENLTVTEAGWDGLR	Deamidated(11)	4.18	3	825.7
31982236	Integrin alpha 6	3	LWNSTFLEEYSK	Deamidated(3)	3.06	2	759.4
568991244	Collagen alpha-1(XIV) chain	4	SFMVNWWTQSPGK	Deamidated(5)Oxidation(3)	3.33	2	699.8
6678085	Alpha-1-antitrypsin 1-4	2	ELVHQSNTSNIFFSPVSIATAFAMLS LGSK	Deamidated(10)Oxidation(24)	6.48	3	1071.9
568986620	Clusterin	3	MLNTSSLLEQLNDQFNWVSQLANL TQGEDIK	Deamidated(3)Deamidated(12)Dea midated(23)Oxidation(1)	3.93	3	1152.5
171846253	Transmembrane glycoprotein NMB	6	NLSDEIFLR	Deamidated(1)	2.42	2	554.3
46849812	Fibronectin	10	WTPLNSSTIIGYR	Deamidated(5)	3.14	2	754.9
124494256	Prolow-density lipoprotein receptor-related protein 1	22	WTGHNVTVVQR	Deamidated(5)	3.57	3	433.2
148747128	dolichyl- diphosphooligosaccharide-- protein glycosyltransferase subunit STT3A	1	TILVDNNTWNNTHISR	Deamidated(10)	5.28	3	633.7
6755863	Endoplasmic	3	HNNDTQHIWESDSNEFSVIADPR	Deamidated(3)	5.79	4	678.8
121674797	Palmitoyl-protein thioesterase 1	2	FFNDSIVDPVDSEWFGFYR	Deamidated(3)	3.17	2	1171.0
225007542	Solute carrier family 15 member 3	1	LQYIAANQTVPQLIGK	Deamidated(7)	3.33	2	879.5
225543173	Cartilage-associated protein	2	DKWGLSDEHFQPRPEAVQFFNVTT LQK	Deamidated(21)	6.17	4	805.4
569003077	Cadherin-2	6	RNWTINR	Deamidated(2)	2.41	2	480.8
124486702	Alpha-1B-glycoprotein	3	FSLGAITSNNSGIYR	Deamidated(9)	2.77	2	800.9
755537859	Solute carrier family 2, facilitated glucose transporter member 4	1	VIEQSYNATWLGR	Deamidated(7)	3.87	2	769.4
31542891	Gamma-glutamyltransferase	2	LWDPSSHPGIQNISR	Deamidated(12)	3.41	3	570.0
7304875	Alpha-2-HS-glycoprotein	2	CPLLTPFNNTNVVHTVNTALAAFNT QNGTYFK	Carbamidomethyl(1)Deamidated(11) Deamidated(17)Deamidated(27)Dea midated(28)	6.66	4	921.9
124486702	Alpha-1B-glycoprotein	3	GTAGFLIYKPGNYSCSYLTHAAGEP SEPSDIVTIK	Carbamidomethyl(15)Deamidated(12)	5.79	4	937.0
121583481	Inhibitor of nuclear factor kappa-B kinase-interacting protein, isoform 1	1	FQNITDFWK	Deamidated(3)	2.86	2	600.3
171846253	Transmembrane glycoprotein NMB	6	DLPIVFDVLIHDPHFNLNSAISYK	Deamidated(18)	3.2	3	952.8
569003077	Cadherin-2	6	VDVIVANLTVTDKDPHTPAWNAAY R	Deamidated(22)	5.97	4	724.6

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1181.6	35.5	1	2.33E+04	2.09E+04	4.07E+04	9.01E+04	1.90E+04	5.18E+04	2.26E+04	2.04E+03	2.59E+05	1.88E+05	2.50E+04
2475.2	59.3	15	8.20E+03	0.00E+00	4.08E+03	2.38E+05	1.27E+04	4.46E+03	2.48E+03	9.92E+03	7.88E+04	1.19E+05	3.05E+04
1517.7	52.0	2	8.72E+04	7.04E+04	0.00E+00	1.05E+05	2.54E+04	0.00E+00	1.90E+04	3.18E+03	9.49E+04	1.32E+05	1.08E+05
1398.6	38.9	8	1.56E+04	1.44E+04	2.23E+03	2.27E+05	3.04E+04	2.72E+04	9.07E+03	1.00E+04	1.44E+05	1.62E+05	1.86E+04
3213.6	75.5	114	3.53E+05	3.77E+04	2.07E+03	1.75E+05	1.53E+04	4.30E+05	2.81E+03	4.18E+05	2.21E+04	4.90E+04	7.43E+05
3455.6	78.6	44	8.06E+03	1.84E+05	1.82E+03	1.54E+05	3.70E+04	1.92E+02	2.83E+03	1.72E+03	3.65E+04	2.02E+04	3.63E+04
1107.6	52.1	1	5.15E+04	1.02E+05	5.07E+04	2.91E+04	5.08E+04	5.95E+04	8.80E+04	8.48E+04	3.68E+04	6.03E+04	1.09E+05
1508.8	51.0	13	1.26E+05	1.95E+05	5.70E+04	1.01E+06	1.28E+05	9.95E+04	5.38E+04	7.21E+04	4.13E+05	8.35E+05	9.62E+04
1297.7	25.7	3	1.87E+04	1.38E+04	5.38E+03	1.42E+04	1.14E+04	1.37E+04	2.11E+04	9.69E+03	4.61E+04	4.43E+04	2.79E+04
1898.9	36.3	16	1.12E+05	4.35E+04	2.86E+04	3.23E+05	1.47E+05	9.33E+04	2.55E+04	4.20E+04	2.57E+05	3.25E+05	6.61E+04
2712.2	42.5	39	1.88E+05	1.71E+05	5.13E+04	8.47E+05	1.29E+05	7.51E+04	7.10E+04	7.16E+04	7.38E+05	4.26E+05	2.17E+05
2341.0	71.7	12	1.24E+04	5.71E+04	2.75E+04	3.52E+04	1.89E+04	1.46E+04	2.61E+03	2.66E+04	2.62E+04	5.18E+04	5.43E+04
1758.0	46.7	8	5.72E+05	3.78E+05	7.77E+05	2.17E+05	7.06E+05	1.44E+06	7.77E+05	5.65E+05	3.54E+05	3.63E+05	2.57E+06
3218.6	48.8	2	6.56E+03	2.13E+04	2.20E+04	7.66E+04	9.40E+03	6.68E+03	0.00E+00	1.53E+04	4.78E+04	2.81E+04	3.70E+04
960.5	25.3	2	5.00E+04	2.96E+04	3.49E+04	4.73E+03	7.33E+04	6.74E+04	3.56E+04	3.21E+04	7.12E+04	1.02E+05	4.01E+04
1600.8	45.8	10	2.38E+03	5.19E+03	0.00E+00	5.11E+03	9.39E+05	1.00E+06	8.32E+04	1.43E+05	3.11E+05	2.22E+03	7.19E+03
1537.8	41.6	8	6.39E+04	6.55E+04	1.37E+05	1.11E+05	1.04E+05	1.19E+05	4.78E+04	5.24E+04	1.85E+05	1.69E+05	1.52E+05
1707.8	36.9	10	1.02E+05	2.93E+04	7.09E+03	9.02E+04	1.81E+04	9.58E+03	3.12E+04	2.54E+04	1.05E+05	6.37E+04	6.95E+04
3684.8	67.6	127	5.44E+05	7.91E+04	1.77E+04	4.47E+05	5.48E+04	1.53E+05	3.00E+02	5.33E+04	6.20E+05	2.49E+05	8.56E+05
3744.8	48.0	4	1.54E+03	0.00E+00	0.00E+00	0.00E+00	8.20E+04	9.13E+04	4.38E+03	9.41E+03	2.24E+04	0.00E+00	0.00E+00
1199.6	51.9	7	1.88E+04	4.52E+04	5.12E+04	1.34E+05	7.07E+04	1.09E+05	2.61E+04	5.68E+04	6.65E+04	1.32E+05	5.48E+04
2856.5	68.5	286	1.75E+04	2.10E+06	4.43E+06	2.56E+03	2.04E+06	0.00E+00	1.27E+03	1.30E+04	0.00E+00	1.53E+03	8.23E+03
2895.5	44.7	6	2.29E+04	1.09E+04	1.40E+04	6.05E+04	3.02E+03	7.58E+03	7.66E+03	2.45E+04	1.09E+05	4.75E+04	3.53E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.99E+05	2.82E+05	3.15E+05	6.80E+05	1.87E+05	1.63E+04	4.02	8.96E+00	5.03E-02	4.05	1.07E+01	3.78E-02	4.44E+04	1.80E+05
1.61E+05	2.31E+05	8.42E+04	2.43E+05	1.09E+05	0.00E+00	3.07	8.21E+00	5.97E-02	3.89	9.60E+00	2.55E-02	2.45E+04	9.54E+04
1.59E+05	1.59E+05	1.42E+05	3.03E+05	1.40E+05	5.53E+03	3.19	4.92E+00	1.15E-02	3.76	6.15E+00	4.97E-03	2.93E+04	1.10E+05
1.08E+05	2.94E+05	1.66E+05	4.52E+05	1.75E+05	4.88E+03	3.24	7.49E+00	6.47E-02	3.75	8.66E+00	3.73E-02	3.50E+04	1.31E+05
1.46E+05	9.87E+04	1.50E+05	1.11E+06	2.59E+04	1.91E+06	3.27	8.01E+00	1.78E-01	3.74	9.00E+00	1.33E-01	9.64E+04	3.61E+05
2.76E+05	9.00E+04	7.05E+04	5.87E+05	4.15E+03	8.21E+03	2.89	8.60E+00	2.68E-01	3.66	1.04E+01	1.87E-01	2.80E+04	1.03E+05
1.02E+05	1.84E+05	1.14E+05	5.21E+05	3.63E+05	6.38E+04	3.09	3.94E+00	6.56E-02	3.66	4.55E+00	3.19E-02	3.70E+04	1.35E+05
1.20E+06	1.21E+06	2.91E+05	1.32E+06	4.21E+05	2.90E+04	2.83	5.86E+00	6.60E-02	3.65	7.39E+00	4.12E-02	1.47E+05	5.38E+05
6.08E+04	7.60E+04	3.44E+04	1.52E+05	4.27E+04	9.86E+03	3.27	4.81E+00	4.10E-02	3.62	6.61E+00	2.40E-02	1.17E+04	4.25E+04
3.27E+05	4.85E+05	3.32E+05	8.65E+05	3.67E+05	2.03E+04	2.93	4.80E+00	4.48E-02	3.52	6.20E+00	2.15E-02	7.55E+04	2.66E+05
5.06E+05	1.02E+06	9.69E+05	2.15E+06	9.81E+05	1.04E+05	3.06	6.12E+00	6.04E-02	3.36	7.13E+00	3.65E-02	1.76E+05	5.92E+05
7.64E+04	5.44E+04	3.90E+04	2.08E+05	3.17E+04	1.74E+04	2.71	4.16E+00	9.02E-02	3.29	4.94E+00	4.37E-02	1.53E+04	5.02E+04
4.71E+05	3.85E+06	1.40E+06	1.58E+06	1.10E+06	8.78E+05	2.38	3.14E+00	7.34E-02	3.13	3.97E+00	5.07E-02	3.66E+05	1.15E+06
7.51E+04	6.27E+04	6.38E+04	1.54E+05	5.46E+04	1.47E+03	2.61	4.77E+00	6.50E-02	3.05	5.54E+00	3.21E-02	1.48E+04	4.51E+04
9.17E+04	1.34E+05	1.36E+05	2.34E+05	1.02E+05	3.00E+04	2.45	2.71E+00	2.49E-02	3.03	3.73E+00	1.01E-02	2.75E+04	8.31E+04
3.09E+04	5.18E+03	7.44E+05	2.65E+06	8.38E+05	7.47E+05	2.27	6.58E+00	3.35E-01	2.77	7.51E+00	2.55E-01	1.54E+05	4.26E+05
1.77E+05	2.20E+05	3.12E+05	4.41E+05	2.74E+05	3.77E+04	2.26	2.28E+00	2.34E-02	2.71	3.44E+00	8.68E-03	6.21E+04	1.68E+05
9.77E+04	1.14E+05	1.30E+05	2.53E+05	1.32E+05	1.24E+04	2.34	3.57E+00	5.02E-02	2.65	4.36E+00	2.46E-02	3.09E+04	8.18E+04
6.15E+05	8.42E+05	5.34E+05	1.22E+05	6.92E+04	6.64E+05	2.26	3.96E+00	6.56E-02	2.56	5.11E+00	5.06E-02	1.50E+05	3.83E+05
5.32E+03	0.00E+00	4.63E+04	2.24E+05	7.04E+04	3.60E+04	2.03	6.41E+00	4.30E-01	2.54	7.49E+00	3.25E-01	1.27E+04	3.23E+04
1.32E+05	1.29E+05	8.81E+04	3.47E+05	8.72E+04	2.91E+04	1.94	2.64E+00	1.32E-01	2.52	3.16E+00	4.72E-02	3.78E+04	9.53E+04
1.61E+04	7.21E+03	1.54E+04	8.84E+06	4.26E+06	2.23E+06	2.01	6.67E+00	4.57E-01	2.49	8.31E+00	3.73E-01	5.03E+05	1.25E+06
7.59E+04	5.35E+04	1.11E+05	1.49E+05	8.13E+04	0.00E+00	2.40	4.47E+00	6.51E-02	2.46	5.41E+00	7.30E-02	2.15E+04	5.28E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
14916479	Cation-dependent mannose-6-phosphate receptor	2	INETHIFNGSNWIMLIYK	Deamidated(2)Deamidated(8)Oxidation(14)	4.68	3	737.7
568999476	Receptor-type tyrosine-protein phosphatase S	1	GFPQILGAAGNVSAGSVLLR	Deamidated(11)	4.18	3	643.4
8850219	Haptoglobin	2	VVLHPNHSVVDIGLIK	Deamidated(6)	4.94	3	581.0
755495403	Antithrombin-III	3	LGACNDTLKQLMEVFKFDTISEK	Carbamidomethyl(4)Deamidated(5)Oxidation(12)	3.18	4	676.8
568933000	Platelet glycoprotein 4	5	RPYIVPILWLNETGTIGDEKAEMFK	Deamidated(11)Oxidation(23)	5.43	4	735.1
568991244	Collagen alpha-1(XIV) chain	4	VVDKGNKSKPTSPEEVK	Deamidated(6)	4.8	2	886.5
568972029	C-type mannose receptor 2	6	ASNASKPGTLER	Deamidated(3)	3.09	2	616.3
568962784	Laminin subunit beta-2	4	AQAALDKANASR	Deamidated(9)	3.51	2	608.8
124486702	Alpha-1B-glycoprotein	3	LLFVGPPQHAGNYSCR	Carbamidomethyl(14)Deamidated(11)	4.1	3	573.9
7305599	Transthyretin	1	TLGISPFHEFADVFTANDSGHR	Deamidated(18)	3.31	4	630.3
147904569	Carboxypeptidase N subunit 2	3	LQDLEITGSPVSNLSAHIFSNLSSLEK	Deamidated(13)	6.55	3	967.5
31982712	Carboxypeptidase B2	3	IPFNVLMMNNVEDLIEQQTFNDTVSPR	Deamidated(20)Oxidation(7)	5.11	3	1017.8
226958497	Serum amyloid P-component	1	LIPHLEKPLQNFTLCFR	Carbamidomethyl(15)Deamidated(11)	4.29	3	709.7
147904569	Carboxypeptidase N subunit 2	3	LSLDSNNLTALHPALFHNLRSR	Deamidated(6)	5.84	4	584.6
219521935	Histocompatibility 2, Q region locus 4	2	TLLSYYNQSAGGSHTIQVISGCEVGS DGR	Carbamidomethyl(22)Deamidated(7)	5.82	3	1019.8
133778978	Cation-independent mannose-6-phosphate receptor	12	SLSPHAGTEPCPPEAAVCLLNGSKPVNLGK	Carbamidomethyl(11)Carbamidomethyl(18)Deamidated(21)	5.47	4	776.1
31981720	Protein Z-dependent protease inhibitor	4	ASQQLSNETSSFGFNLLR	Deamidated(7)	5.88	2	1000.5
568956041	Cadherin-13	6	NLSVVILGASDK	Deamidated(1)	2.96	2	608.8
21389311	Intercellular adhesion molecule 1	2	VVLLSGVEPRPPTPQVQFTLNASSE DHR	Deamidated(21)	7.06	4	801.4
227499988	Choline transporter-like protein 1	1	FAEINGSALCSYNIKPSEYTLTSK	Carbamidomethyl(10)Deamidated(5)	6.08	3	898.8
568994656	Leukocyte surface antigen CD47	3	NSTTTDQNFSAK	Deamidated(1)Deamidated(8)	2.68	2	708.8
31982171	Murinoglobulin-1	4	SLGNVNFVSVAEAQSSSEPCGSEVATVPETGR	Carbamidomethyl(20)Deamidated(6)	6.72	3	1099.2
31982712	Carboxypeptidase B2	3	EVHFFVNASDVDSVK	Deamidated(7)	3.19	3	564.9
568990229	Leukemia inhibitory factor receptor	3	KVPSNSTETVIESDQFQPGVR	Deamidated(5)	5.73	3	773.7
568913156	Prostaglandin-H2 D-Protein Z-dependent protease inhibitor	1	TVVAPSTEGGLNLTSTFLR	Deamidated(12)	3.98	2	982.5
31981720	Protein Z-dependent protease inhibitor	4	LPYQGNATMLVVLMEK	Deamidated(6)Oxidation(9)Oxidation(14)	5.04	2	920.5

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2211.1	62.6	18	2.81E+04	2.06E+05	2.93E+04	1.39E+05	5.86E+04	6.00E+04	3.98E+04	1.88E+05	7.34E+04	8.93E+04	2.24E+05
1928.1	58.9	1	1.11E+04	1.83E+04	3.63E+04	1.49E+04	4.54E+04	3.27E+04	3.98E+03	1.96E+04	8.49E+03	5.49E+03	1.84E+05
1741.0	39.6	31	3.34E+05	6.89E+05	5.41E+05	2.35E+05	4.06E+05	3.63E+05	2.00E+05	2.98E+05	4.03E+05	9.36E+05	1.15E+06
2704.3	56.1	26	2.16E+05	2.21E+05	6.05E+05	2.54E+05	2.94E+05	2.45E+05	1.18E+05	2.14E+05	5.50E+05	3.18E+05	1.19E+06
2937.5	54.5	5	4.27E+04	5.38E+04	1.19E+05	1.04E+05	1.56E+05	1.79E+05	2.65E+04	1.37E+05	9.57E+04	9.17E+04	1.31E+05
1771.9	18.5	19	2.34E+04	1.65E+05	3.99E+05	0.00E+00	8.81E+04	5.91E+04	4.38E+04	3.18E+05	8.18E+04	7.02E+04	2.96E+05
1231.6	18.3	33	1.13E+03	2.41E+05	2.67E+05	5.43E+02	2.99E+01	3.40E+01	3.56E+03	1.89E+05	8.04E+04	5.28E+04	1.83E+05
1216.6	18.6	38	3.31E+02	2.33E+05	4.77E+05	0.00E+00	1.50E+03	3.02E+01	3.84E+05	2.37E+05	9.96E+04	1.34E+05	3.37E+05
1719.8	34.5	9	1.85E+03	1.16E+04	7.39E+03	2.09E+03	3.57E+05	3.84E+05	4.55E+04	5.02E+04	8.29E+04	2.01E+03	5.09E+03
2518.2	53.7	15	1.09E+05	2.02E+05	2.24E+05	5.59E+04	2.53E+05	3.07E+05	1.55E+04	8.61E+04	3.71E+04	5.13E+04	3.60E+05
2900.5	64.0	29	7.45E+04	1.05E+05	1.95E+05	8.45E+04	1.59E+05	1.52E+05	7.31E+03	4.33E+04	5.62E+04	2.35E+04	1.76E+05
3051.5	66.4	49	9.82E+04	1.68E+05	1.65E+05	1.04E+05	1.54E+05	1.08E+05	7.76E+03	5.81E+04	1.19E+05	9.34E+04	2.50E+05
2127.1	48.5	18	8.44E+04	1.64E+05	3.82E+05	1.03E+05	3.90E+05	3.89E+05	9.72E+04	1.79E+05	4.46E+05	1.70E+05	5.63E+05
2335.2	49.5	36	1.34E+05	2.35E+05	3.09E+05	1.26E+05	3.91E+05	4.07E+05	4.28E+04	8.25E+04	2.42E+05	1.82E+05	4.83E+05
3057.4	44.8	12	1.00E+05	1.71E+05	2.04E+05	6.07E+04	2.71E+05	2.57E+05	7.04E+04	9.97E+04	1.09E+05	1.02E+05	3.25E+05
3101.5	42.9	9	3.44E+05	3.75E+05	5.93E+05	2.54E+05	5.00E+05	4.32E+05	6.08E+05	9.00E+05	8.98E+05	4.08E+05	1.08E+06
2000.0	53.4	53	5.46E+05	1.16E+06	1.62E+06	6.82E+05	1.71E+06	1.36E+06	4.98E+05	4.17E+05	1.06E+06	9.78E+05	2.22E+06
1216.7	50.2	7	7.20E+04	9.59E+04	1.59E+05	4.36E+04	2.73E+05	2.31E+05	7.71E+04	1.80E+05	1.10E+05	9.08E+04	4.35E+05
3202.7	43.5	24	4.90E+05	3.54E+05	7.40E+05	3.33E+05	1.16E+06	9.65E+05	2.28E+05	5.79E+05	9.15E+05	7.60E+05	1.18E+06
2694.3	45.8	15	1.66E+05	1.64E+05	4.18E+05	9.45E+04	3.59E+05	2.80E+05	8.07E+04	1.52E+05	2.96E+05	1.80E+05	3.48E+05
1416.6	22.4	11	1.34E+05	5.78E+04	1.57E+05	0.00E+00	2.45E+05	1.31E+05	7.19E+04	9.79E+04	1.48E+05	1.25E+05	2.11E+05
3295.5	44.7	10	7.73E+04	2.20E+05	3.26E+05	8.59E+04	1.50E+05	2.56E+05	2.41E+04	5.07E+04	1.07E+05	9.94E+04	4.76E+05
1692.8	42.4	10	1.81E+05	2.72E+05	2.93E+05	1.94E+05	3.23E+05	3.10E+05	6.94E+04	1.43E+05	2.07E+05	1.87E+05	4.32E+05
2319.2	34.5	9	9.90E+04	1.16E+05	9.17E+04	4.60E+04	2.19E+05	1.90E+05	2.60E+04	2.18E+04	4.14E+04	1.10E+05	1.43E+05
1964.0	54.1	6	5.35E+04	9.70E+04	1.02E+05	1.34E+04	1.38E+05	1.46E+05	3.92E+04	3.49E+04	6.75E+04	8.75E+04	8.48E+04
1839.9	45.8	42	5.11E+05	1.08E+06	1.28E+06	6.32E+05	1.23E+06	1.17E+06	6.64E+05	3.93E+05	8.91E+05	8.33E+05	1.61E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.74E+05	1.38E+05	1.23E+05	5.57E+05	1.61E+05	3.97E+04	2.06	3.29E+00	1.44E-01	2.40	3.81E+00	7.11E-02	5.78E+04	1.39E+05
8.62E+03	1.03E+04	2.03E+04	2.68E+04	3.36E+04	2.11E+04	1.83	4.01E+00	4.39E-01	2.37	4.86E+00	3.24E-01	1.17E+04	2.78E+04
8.12E+05	7.66E+05	3.61E+05	4.60E+05	3.19E+05	8.90E+05	1.85	1.51E+00	1.93E-02	2.36	2.27E+00	1.01E-02	2.34E+05	5.52E+05
1.00E+06	1.87E+05	2.70E+05	4.51E+05	7.29E+05	3.49E+05	1.87	2.24E+00	9.82E-02	2.22	3.28E+00	6.92E-02	1.92E+05	4.25E+05
1.40E+05	1.40E+05	1.36E+05	5.31E+05	1.83E+05	1.02E+05	1.79	2.34E+00	1.69E-01	2.21	2.70E+00	6.29E-02	6.01E+04	1.33E+05
6.98E+04	1.67E+05	2.34E+05	4.47E+05	3.17E+05	4.12E+05	1.93	3.13E+00	9.84E-02	2.18	3.36E+00	3.55E-02	8.16E+04	1.78E+05
7.26E+04	1.32E+05	1.72E+05	3.07E+05	2.03E+05	2.65E+05	1.99	3.62E+00	9.80E-02	2.18	3.55E+00	3.82E-02	5.70E+04	1.24E+05
2.16E+05	1.93E+05	2.70E+05	5.54E+05	2.55E+05	3.18E+05	1.79	2.85E+00	1.20E-01	2.14	2.98E+00	2.06E-02	9.74E+04	2.09E+05
1.03E+03	2.16E+03	2.11E+05	6.22E+05	2.70E+05	2.79E+05	1.66	4.53E+00	4.71E-01	2.09	5.28E+00	3.10E-01	5.64E+04	1.18E+05
1.57E+05	2.15E+05	1.77E+05	2.73E+05	1.57E+05	4.05E+05	1.57	1.96E+00	1.55E-01	2.08	2.25E+00	1.67E-02	7.84E+04	1.63E+05
9.99E+04	6.63E+04	1.60E+05	2.51E+05	1.26E+05	3.68E+05	1.63	2.14E+00	1.89E-01	2.08	2.31E+00	4.76E-02	5.44E+04	1.13E+05
1.80E+05	1.09E+05	1.13E+05	1.77E+05	1.25E+05	4.32E+05	1.70	1.84E+00	1.12E-01	2.07	2.14E+00	2.47E-02	6.50E+04	1.35E+05
5.77E+05	1.49E+05	2.87E+05	5.05E+05	2.47E+05	9.23E+05	1.72	2.10E+00	1.19E-01	2.02	2.76E+00	5.47E-02	1.55E+05	3.14E+05
3.48E+05	2.04E+05	3.39E+05	4.11E+05	2.99E+05	5.17E+05	1.59	1.51E+00	5.22E-02	2.02	1.76E+00	2.55E-03	1.27E+05	2.58E+05
2.45E+05	1.68E+05	1.95E+05	2.27E+05	2.14E+05	3.98E+05	1.57	1.45E+00	6.19E-02	2.02	1.52E+00	2.72E-03	8.54E+04	1.73E+05
4.22E+05	1.75E+06	1.65E+06	4.87E+05	9.94E+05	7.52E+05	1.73	1.71E+00	8.03E-02	2.01	2.69E+00	6.63E-02	3.55E+05	7.16E+05
1.78E+06	1.02E+06	1.22E+06	1.54E+06	1.19E+06	2.64E+06	1.56	1.36E+00	5.37E-02	2.00	1.63E+00	3.79E-03	5.86E+05	1.17E+06
1.13E+05	1.86E+05	2.10E+05	2.60E+05	3.02E+05	1.56E+05	1.59	1.71E+00	1.13E-01	1.98	1.92E+00	2.02E-02	8.08E+04	1.60E+05
1.09E+06	7.23E+05	1.18E+06	1.74E+06	9.88E+05	4.60E+05	1.59	1.41E+00	4.90E-02	1.98	1.93E+00	9.31E-03	3.90E+05	7.70E+05
1.49E+05	2.34E+05	6.98E+05	7.17E+05	2.40E+05	2.39E+05	1.57	1.86E+00	1.85E-01	1.94	2.42E+00	8.05E-02	1.35E+05	2.62E+05
2.08E+05	1.14E+05	2.18E+05	2.80E+05	1.59E+05	1.03E+05	1.53	1.46E+00	7.40E-02	1.94	1.88E+00	1.05E-02	6.95E+04	1.35E+05
2.27E+05	1.68E+05	1.32E+05	1.78E+05	1.06E+05	3.14E+05	1.48	1.93E+00	2.46E-01	1.92	2.32E+00	5.87E-02	8.26E+04	1.58E+05
3.17E+05	2.27E+05	2.61E+05	3.00E+05	2.53E+05	7.14E+05	1.52	1.35E+00	1.12E-01	1.91	1.49E+00	1.24E-02	1.30E+05	2.47E+05
6.76E+04	1.00E+05	1.10E+05	1.41E+05	1.32E+05	2.56E+05	1.40	1.64E+00	2.37E-01	1.89	1.75E+00	7.79E-03	5.13E+04	9.70E+04
1.19E+05	9.09E+04	1.13E+05	1.51E+05	9.55E+04	1.46E+05	1.44	1.22E+00	8.26E-02	1.89	1.40E+00	1.45E-03	4.43E+04	8.36E+04
1.57E+06	7.84E+05	9.72E+05	1.16E+06	1.02E+06	2.13E+06	1.45	1.09E+00	7.37E-02	1.84	1.38E+00	6.66E-03	5.12E+05	9.42E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568971816	Intercellular adhesion molecule 2	6	ETLKNQTFGGAETVPQEATATFNST ALKK	Deamidated(5)Deamidated(23)	5.2	4	771.9
569006892	Very low-density lipoprotein receptor	1	DINTTDILR	Deamidated(3)	2.66	2	531.3
147904569	Carboxypeptidase N subunit 2	3	LQLLNLSR	Deamidated(5)	2.43	2	479.3
31981720	Protein Z-dependent protease inhibitor	4	EGNFTSTFDK	Deamidated(3)	2.78	2	573.8
755495403	Antithrombin-III	3	SLTFNESYQDVSEVVYGA	Deamidated(5)	4.74	3	713.0
568915555	Integrin alpha V	4	IKTPEKNDTAAAGQGER	Deamidated(7)	4.72	3	596.3
568939471	Serum paraoxonase/arylesterase 1	2	ITVVYAENGTVLQGTTVASVYK	Deamidated(8)	4.91	2	1157.6
226874935	Inter-alpha trypsin inhibitor, heavy chain 2	1	GAFISNFTMTVNGMTFTSSIK	Deamidated(6)Deamidated(12)Oxidation(9)Oxidation(14)	3.61	2	1144.5
755528177	Macrophage metalloelastase	1	LQEMQQFFGLEATGQLDNSTLAIM HIPR	Deamidated(18)Oxidation(4)Oxidation(24)	8.47	3	1074.5
158635948	N-acetylmuramoyl-L-alanine amidase	1	LEPEHLQLQNISQEQLAQVATLTK	Deamidated(10)	7.68	3	935.2
244791354	Phosphatidylcholine-sterol acyltransferase	2	AELSNHTRPVILVPGCLGNR	Carbamidomethyl(16)Deamidated(5)	4.65	4	551.8
148747546	Serine protease inhibitor A3K	4	NLINDYVSNQTQGMK	Deamidated(4)Deamidated(9)Oxidation(14)	3.71	2	928.4
6678085	Alpha-1-antitrypsin 1-4	2	GDTHTQILEGLQFNLTQTSEADIHK	Deamidated(14)	7.78	4	700.1
568915857	Phospholipid transfer protein	4	FQIYSNQSALSLALIPLQAPLK	Deamidated(6)	6.48	3	849.1
160358825	Beta-2-glycoprotein 1	3	DYRPSAGNNSLYQDTVVFK	Deamidated(8)	5.66	3	725.7
755509347	Mannan-binding lectin serine protease 2	2	GDSGGALVFLDNETQR	Deamidated(12)	3.89	2	840.4
755470204	H-2 class I histocompatibility antigen	1	EQNYTCHVYHEGLPEPLTLR	Carbamidomethyl(6)Deamidated(3)	5.83	3	819.7
244791354	Phosphatidylcholine-sterol acyltransferase	2	QSQPVHLLPMNETDHLNMVFSNK	Deamidated(11)Deamidated(22)Oxidation(10)Oxidation(18)	4.18	4	679.1
31982171	Murinoglobulin-1	4	YLNQQLTQK	Deamidated(3)	3.09	2	683.8
31982171	Murinoglobulin-1	4	NYEVQLFHVNATVTEEGTGLEFSR	Deamidated(10)	4.09	3	914.4
156616286	Collagen alpha-6(VI) chain	11	EANQTQLR	Deamidated(3)	2.47	2	480.7
75677587	Growth differentiation factor 3	1	VLYFNLSAIK	Deamidated(5)	2.49	2	584.8
19527214	Apolipoprotein N	1	TQNGSLPAVTR	Deamidated(3)	2.91	2	572.8
109627652	Complement factor H	2	LTEFTHNSTMDYK	Deamidated(7)Oxidation(10)	4.45	2	802.4
113865991	LPS-binding protein	1	VYHQAGYLNFSITDDMLPHDSGIR	Deamidated(9)Oxidation(16)	4.68	3	922.8
568956041	Cadherin-13	6	NLSVVILGASDKDLHPNTDPFK	Deamidated(1)	6.03	3	794.4
19527130	EMILIN-1	7	ESNSTSLTQAALLEK	Deamidated(3)	4.35	2	796.9
21687214	Sphingosine 1-phosphate receptor 1	1	HNYTGK	Deamidated(3)	2.69	2	442.2
13507644	Carboxypeptidase N catalytic chain	2	GMVLDENSNLGTGAVISVTGINHDV TSGEHGDYFR	Deamidated(10)Oxidation(2)	8.49	4	934.7

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
3084.5	41.5	13	4.53E+05	4.92E+05	6.12E+05	3.50E+05	8.78E+05	8.17E+05	4.95E+05	8.10E+05	7.56E+05	4.86E+05	9.35E+05
1061.6	41.0	6	4.88E+04	3.95E+04	1.20E+05	2.39E+04	1.33E+05	1.15E+05	4.33E+04	7.81E+04	5.61E+04	6.18E+04	1.33E+05
957.6	44.7	1	1.06E+05	1.48E+05	1.75E+05	5.27E+04	2.77E+05	2.91E+05	8.09E+04	5.08E+04	1.61E+05	1.07E+05	2.35E+05
1146.5	32.5	11	2.58E+05	4.83E+05	6.52E+05	2.87E+05	5.92E+05	6.06E+05	4.54E+05	1.46E+05	4.63E+05	3.62E+05	7.57E+05
2137.0	53.8	85	3.58E+05	1.53E+06	1.30E+06	3.74E+05	1.81E+06	1.68E+06	1.19E+05	2.17E+05	3.40E+05	3.33E+05	7.62E+05
1786.9	17.7	31	0.00E+00	5.85E+05	6.08E+05	0.00E+00	4.48E+03	0.00E+00	2.28E+02	3.98E+05	1.40E+05	9.84E+04	2.50E+05
2314.2	48.8	20	9.53E+04	1.09E+05	1.96E+05	1.05E+05	3.62E+05	3.03E+05	1.97E+04	7.60E+04	1.75E+05	5.69E+04	2.59E+05
2288.1	53.8	51	1.04E+06	1.64E+05	1.28E+06	7.39E+05	3.03E+06	2.85E+06	2.28E+05	1.29E+06	1.32E+06	2.06E+06	2.34E+06
3221.6	53.6	10	6.43E+04	1.40E+05	2.28E+05	4.66E+04	2.70E+05	2.08E+05	4.60E+03	2.91E+04	6.66E+04	4.83E+04	1.61E+05
2803.5	53.6	6	9.40E+04	2.59E+05	2.03E+05	7.20E+04	1.43E+05	1.46E+05	3.65E+04	4.16E+04	9.81E+04	5.73E+04	2.15E+05
2204.2	36.8	14	5.64E+04	1.94E+05	1.52E+05	4.40E+04	3.77E+05	3.39E+05	6.60E+04	3.21E+04	1.88E+05	1.23E+05	2.86E+05
1855.9	38.1	90	3.37E+05	8.75E+05	6.25E+05	3.43E+05	8.27E+05	8.26E+05	1.88E+05	1.93E+05	6.04E+05	2.64E+05	9.17E+05
2797.4	47.8	755	4.39E+04	1.19E+05	1.33E+05	8.11E+04	1.11E+05	1.63E+05	1.97E+04	5.29E+04	9.30E+04	4.14E+04	2.52E+05
2545.4	69.9	48	4.06E+05	5.46E+05	1.25E+06	2.64E+05	1.23E+06	9.75E+05	8.58E+04	4.95E+05	3.38E+05	1.30E+05	1.22E+06
2175.0	42.2	85	3.75E+06	3.72E+06	4.58E+06	1.89E+06	6.71E+06	5.92E+06	2.66E+06	2.05E+06	3.04E+06	3.02E+06	5.08E+06
1679.8	47.1	19	2.41E+05	5.07E+05	5.22E+05	3.05E+05	5.56E+05	6.08E+05	3.08E+05	2.54E+05	4.32E+05	3.04E+05	7.13E+05
2457.1	38.5	12	3.04E+05	5.44E+05	7.32E+05	2.40E+05	6.93E+05	6.87E+05	1.20E+05	1.22E+05	3.00E+05	2.73E+05	9.13E+05
2713.3	40.5	3	3.27E+04	6.35E+04	8.01E+04	2.71E+04	1.88E+05	1.71E+05	1.71E+04	1.26E+04	1.03E+05	7.02E+04	1.27E+05
1366.7	28.7	18	1.33E+06	2.62E+06	2.62E+06	1.28E+06	2.55E+06	2.38E+06	1.28E+06	5.75E+05	1.48E+06	1.58E+06	2.78E+06
2741.3	52.6	21	1.68E+05	4.97E+05	6.60E+05	2.60E+05	3.74E+05	3.17E+05	4.89E+04	1.14E+05	2.00E+05	1.01E+05	4.37E+05
960.5	17.2	1	5.22E+05	1.24E+05	6.14E+05	0.00E+00	9.21E+05	0.00E+00	3.12E+05	5.86E+05	2.99E+05	2.77E+05	7.45E+05
1168.7	52.9	1	8.11E+03	2.41E+04	1.83E+04	4.30E+03	1.23E+05	7.88E+04	9.68E+03	2.67E+04	1.10E+04	8.61E+02	3.45E+04
1144.6	27.1	11	1.01E+05	1.31E+05	1.71E+05	1.76E+04	2.20E+05	1.67E+05	7.74E+04	5.17E+04	9.85E+04	1.02E+05	1.82E+05
1603.7	25.2	39	1.37E+06	1.25E+06	1.96E+06	9.41E+03	3.28E+06	2.71E+06	1.43E+06	7.82E+05	1.89E+06	1.16E+06	2.07E+06
2766.3	44.0	27	2.75E+05	5.75E+05	6.70E+05	1.71E+05	5.30E+05	5.58E+05	1.37E+05	1.88E+05	5.49E+05	2.60E+05	5.63E+05
2381.2	49.4	22	2.97E+05	3.29E+05	6.96E+05	2.03E+05	8.73E+05	6.36E+05	1.23E+05	5.49E+05	3.46E+05	2.94E+05	7.91E+05
1592.8	39.1	65	2.72E+05	3.08E+05	4.54E+05	1.93E+05	7.80E+05	6.80E+05	2.54E+05	2.87E+05	4.50E+05	4.30E+05	5.53E+05
883.4	17.2	6	3.00E+04	5.39E+04	9.49E+04	1.01E+02	1.65E+05	1.66E+02	1.99E+04	8.04E+04	4.13E+04	2.96E+04	8.20E+04
3735.7	50.3	21	1.79E+05	3.27E+05	3.35E+05	1.69E+05	5.25E+05	4.77E+05	6.05E+04	1.75E+05	1.77E+05	1.46E+05	5.04E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
5.51E+05	1.11E+06	1.27E+06	9.26E+05	1.80E+06	5.89E+05	1.52	1.16E+00	8.11E-02	1.83	1.60E+00	1.71E-02	3.86E+05	7.08E+05
1.03E+05	6.86E+04	1.20E+05	1.13E+05	1.12E+05	1.07E+05	1.40	1.10E+00	8.92E-02	1.81	1.25E+00	1.56E-03	4.22E+04	7.65E+04
1.74E+05	1.39E+05	2.43E+05	2.86E+05	1.65E+05	3.46E+05	1.42	1.38E+00	1.46E-01	1.81	1.55E+00	8.59E-03	8.65E+04	1.56E+05
6.24E+05	4.50E+05	4.93E+05	5.64E+05	5.86E+05	1.13E+06	1.42	1.10E+00	9.68E-02	1.79	1.30E+00	4.84E-03	2.56E+05	4.58E+05
7.07E+05	1.34E+06	1.58E+06	1.49E+06	5.72E+05	2.31E+06	1.33	1.85E+00	4.11E-01	1.79	2.24E+00	7.68E-02	4.68E+05	8.36E+05
1.60E+05	2.48E+05	2.85E+05	5.20E+05	4.23E+05	4.97E+05	1.61	3.00E+00	2.77E-01	1.78	2.96E+00	1.35E-01	1.24E+05	2.22E+05
1.20E+05	1.13E+05	2.21E+05	3.86E+05	2.27E+05	4.58E+05	1.44	1.86E+00	2.72E-01	1.78	2.00E+00	6.08E-02	9.20E+04	1.64E+05
1.23E+06	1.31E+06	2.16E+06	2.64E+06	2.13E+06	3.03E+05	1.34	1.60E+00	3.17E-01	1.77	1.95E+00	4.29E-02	7.64E+05	1.35E+06
7.23E+04	9.95E+04	9.97E+04	2.57E+05	2.52E+05	3.03E+05	1.38	1.96E+00	3.63E-01	1.77	2.08E+00	6.25E-02	6.42E+04	1.14E+05
1.48E+05	1.23E+05	1.80E+05	2.33E+05	1.48E+05	2.66E+05	1.41	1.41E+00	1.64E-01	1.77	1.67E+00	1.77E-02	7.11E+04	1.26E+05
1.18E+05	1.36E+05	2.13E+05	2.28E+05	1.90E+05	5.11E+05	1.40	1.91E+00	3.16E-01	1.76	2.10E+00	6.27E-02	9.28E+04	1.63E+05
5.32E+05	7.78E+05	5.84E+05	9.56E+05	7.11E+05	1.38E+06	1.43	1.36E+00	1.47E-01	1.75	1.59E+00	1.78E-02	3.17E+05	5.56E+05
1.29E+05	1.05E+05	9.00E+04	1.40E+05	4.75E+04	2.07E+05	1.39	1.52E+00	2.59E-01	1.75	1.82E+00	6.80E-02	5.35E+04	9.36E+04
3.67E+05	4.89E+05	7.09E+05	1.24E+06	1.10E+06	1.64E+06	1.39	1.79E+00	3.17E-01	1.74	1.86E+00	6.61E-02	3.48E+05	6.07E+05
5.80E+06	3.45E+06	5.12E+06	6.65E+06	4.42E+06	6.81E+06	1.32	9.39E-01	1.16E-01	1.73	1.01E+00	1.74E-03	2.18E+06	3.77E+06
5.32E+05	5.59E+05	5.86E+05	6.26E+05	5.49E+05	6.49E+05	1.36	7.52E-01	3.20E-02	1.72	9.82E-01	7.59E-04	2.46E+05	4.22E+05
6.25E+05	5.56E+05	3.52E+05	2.93E+05	3.62E+05	9.35E+05	1.30	1.42E+00	3.46E-01	1.72	1.68E+00	4.88E-02	2.35E+05	4.03E+05
9.26E+04	4.60E+04	1.22E+05	9.38E+04	8.42E+04	1.90E+05	1.34	1.70E+00	3.47E-01	1.71	2.01E+00	5.91E-02	4.48E+04	7.66E+04
2.76E+06	2.04E+06	2.13E+06	2.54E+06	1.33E+06	3.46E+06	1.30	9.40E-01	1.49E-01	1.70	1.17E+00	5.95E-03	1.03E+06	1.76E+06
4.33E+05	3.15E+05	3.48E+05	5.10E+05	2.95E+05	6.66E+05	1.32	1.44E+00	2.95E-01	1.70	1.69E+00	3.71E-02	1.68E+05	2.85E+05
3.74E+05	3.55E+05	5.96E+05	7.90E+05	3.70E+05	5.67E+05	1.36	1.64E+00	3.00E-01	1.70	1.83E+00	4.49E-02	2.23E+05	3.78E+05
1.41E+04	1.38E+04	5.23E+04	8.92E+04	5.89E+04	7.84E+04	1.27	2.46E+00	6.17E-01	1.66	2.81E+00	2.27E-01	1.79E+04	2.98E+04
1.73E+05	1.05E+05	1.38E+05	1.24E+05	1.04E+05	2.41E+05	1.27	1.13E+00	2.75E-01	1.66	1.30E+00	1.48E-02	6.61E+04	1.10E+05
2.10E+06	1.50E+06	2.29E+06	2.79E+06	1.54E+06	3.73E+06	1.32	1.29E+00	2.54E-01	1.66	1.47E+00	2.32E-02	9.57E+05	1.59E+06
6.14E+05	3.23E+05	4.86E+05	8.66E+05	5.32E+05	8.00E+05	1.37	1.22E+00	1.61E-01	1.66	1.56E+00	3.11E-02	2.47E+05	4.09E+05
4.53E+05	5.87E+05	5.00E+05	7.75E+05	9.09E+05	4.02E+05	1.31	1.21E+00	2.39E-01	1.65	1.28E+00	1.28E-02	2.62E+05	4.34E+05
5.11E+05	4.00E+05	6.03E+05	8.83E+05	5.65E+05	2.56E+05	1.28	1.08E+00	2.33E-01	1.65	1.32E+00	1.83E-02	2.40E+05	3.97E+05
4.66E+04	5.37E+04	9.46E+04	9.96E+04	8.96E+04	7.43E+04	1.32	1.76E+00	4.00E-01	1.65	1.87E+00	6.86E-02	3.17E+04	5.23E+04
2.99E+05	2.77E+05	3.29E+05	4.00E+05	3.22E+05	4.51E+05	1.27	1.15E+00	2.91E-01	1.65	1.19E+00	8.97E-03	1.52E+05	2.52E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568921717	Complement factor I	1	FNVSLIYGR	Deamidated(2)	2.6	2	535.3
755532856	Laminin, alpha 2	17	VFQAESHAQLNDSSAVLDGILDEAK	Deamidated(12)	6.82	3	910.4
160333710;755542383	Serine protease inhibitor A3M	1	FNLTETSEADIHQGFGHLLQR	Deamidated(2)	6.66	3	805.4
225007625	Interleukin-6 receptor subunit beta	3	VKPTPPYNLSVTNSEELSSILK	Deamidated(8)	6.42	3	806.4
148747546	Serine protease inhibitor A3K	4	FNLTETPEADIHQGFGNLLQSLSQPEDQDQINIGNAMFIEK	Deamidated(2)Deamidated(17)Oxidation(37)	5.74	4	1155.6
568956041	Cadherin-13	6	ANYNLPIMVTDSGKPPMTNITDLRIVLDPSGSMNIYLVLDGSDSIGSSNFTGAK	Deamidated(19)Oxidation(8)Oxidation(17)	3.17	3	898.4
569017755	Complement factor B	1	IVLDPSGSMNIYLVLDGSDSIGSSNFTGAK	Deamidated(25)Oxidation(9)	4.81	3	1025.8
58037159	Complement component C8 gamma chain	1	EANLTEDQILFFPK	Deamidated(3)	4.18	2	833.4
226371752	Beta-type platelet-derived growth factor receptor	1	AINISVIENGYVR	Deamidated(3)Deamidated(9)	3.19	2	725.4
160333901	Cell surface glycoprotein MUC18	1	ASGNFSQVDWFLIHK	Deamidated(4)	4.65	3	584.0
11096336	Carbohydrate sulfotransferase 7	1	APDSANLTTAMLFRR	Deamidated(6)Oxidation(11)	3.89	2	762.9
247269929	Liver carboxylesterase N	1	FHSELNISESMIPAVIEQYLR	Deamidated(6)Oxidation(11)	4.95	3	831.7
51092293	Keratin, type II cytoskeletal 1b	1	WELLQQVNTSTR	Deamidated(8)	3.65	2	738.4
568953122	Insulin receptor	4	ELGLYNLMNITR	Deamidated(9)Oxidation(8)	3.33	2	727.4
568956041	Cadherin-13	6	INNTHALVSLQLNLNK	Deamidated(2)	7.07	3	598.3
6753138	Sodium/potassium-transporting ATPase subunit	4	VLGFKPKPPKNESLETYPLMMK	Carbamyl(10)Deamidated(11)Oxidation(20)Oxidation(21)	3.4	4	645.6
45504394	Integrin beta-1	7	NGVNGTGENGRRK	Deamidated(1)Deamidated(4)Deamidated(9)	2.97	2	602.8
156616286	Collagen alpha-6(VI) chain	11	GVPQVLIVITDGESHDAEKLNTTAK	Deamidated(21)	5.68	4	659.9
6753138	Sodium/potassium-transporting ATPase subunit	4	FKLDWLGNCGLNDDSYGYR	Carbamidomethyl(9)Deamidated(8)	4.87	3	794.4
31981720	Protein Z-dependent protease inhibitor	4	EGNFTSTFDKK	Deamidated(3)	2.57	2	637.8
6753484	Collagen alpha-1(VI) chain	5	AALQFLQNYTVLASSVDSMDFINDATDVNDALSIVTR	Deamidated(23)Oxidation(19)	5.74	3	1362.6
568915857	Phospholipid transfer protein	4	RFQIYSNQSALESALIPLQAPLK	Deamidated(7)	5.63	3	901.2
7242138	Sodium/potassium-transporting ATPase subunit	3	FLEPYNDSIQAQK	Deamidated(6)	3.71	2	777.4
568990229	Leukemia inhibitory factor receptor	3	IEGLTNETYR	Deamidated(6)	2.67	2	598.8
225735655	prosaposin	7	KLVLYLEHNLEKNSTK	Deamidated(13)	5.13	3	644.0

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1069.6	47.8	1	9.81E+04	1.30E+05	1.49E+05	5.95E+04	2.63E+05	2.06E+05	4.90E+04	9.43E+04	6.87E+04	8.24E+04	2.07E+05
2729.3	45.4	55	1.51E+06	3.05E+06	4.10E+06	1.25E+06	4.00E+06	4.01E+06	1.02E+06	2.26E+06	1.84E+06	1.54E+06	5.28E+06
2414.2	46.6	40	3.66E+05	1.12E+06	1.47E+06	6.48E+05	1.59E+06	1.63E+06	3.83E+05	8.18E+05	1.92E+06	3.48E+05	2.63E+06
2417.3	49.3	17	5.31E+05	6.68E+05	7.63E+05	4.94E+05	8.49E+05	7.59E+05	3.14E+05	8.23E+05	7.07E+05	3.32E+05	1.10E+06
4619.2	65.9	28	2.65E+05	6.50E+05	6.53E+05	4.01E+05	5.58E+05	4.97E+05	2.45E+04	1.82E+05	3.70E+05	1.06E+05	8.15E+05
2693.3	43.8	95	4.64E+06	3.05E+06	7.07E+06	2.03E+06	9.80E+06	1.05E+07	2.42E+06	5.50E+06	4.00E+06	5.01E+06	8.52E+06
3075.5	61.7	26	1.21E+05	2.29E+05	3.53E+05	2.07E+05	4.14E+05	3.54E+05	3.93E+04	1.04E+05	1.43E+05	3.61E+04	3.95E+05
1665.8	56.6	18	1.53E+05	4.48E+05	4.44E+05	1.99E+05	4.12E+05	3.39E+05	7.82E+04	1.28E+05	2.56E+05	2.23E+05	4.94E+05
1449.8	47.4	16	2.58E+05	5.30E+05	5.87E+05	2.68E+05	4.42E+05	3.81E+05	2.08E+05	4.17E+05	3.41E+05	1.74E+05	6.48E+05
1749.9	51.0	13	4.27E+05	4.79E+05	4.42E+05	5.74E+05	5.68E+05	5.21E+05	1.96E+05	3.61E+05	3.73E+05	3.83E+05	3.68E+05
1524.7	44.1	10	0.00E+00	5.44E+04	3.46E+04	2.50E+04	6.40E+04	1.05E+05	3.86E+03	3.08E+04	2.50E+04	3.94E+04	1.96E+04
2493.2	61.6	16	1.21E+05	1.75E+05	1.33E+05	4.94E+04	2.62E+05	2.53E+05	5.34E+03	1.18E+05	1.46E+05	2.69E+04	1.37E+05
1475.8	44.8	1	1.49E+04	5.67E+04	1.52E+04	3.94E+04	1.06E+04	2.22E+03	9.06E+03	3.75E+05	7.91E+04	1.38E+05	2.74E+05
1453.7	49.5	13	1.42E+05	9.27E+04	3.02E+05	1.13E+05	3.60E+05	3.81E+05	1.01E+05	2.06E+05	1.99E+05	1.45E+05	2.53E+05
1793.0	52.9	160	3.73E+06	2.80E+06	7.31E+06	2.30E+06	1.03E+07	1.01E+07	1.51E+06	5.71E+06	3.59E+06	4.01E+06	9.08E+06
2579.4	33.2	107	2.54E+05	1.01E+05	3.68E+05	1.50E+05	6.29E+05	4.64E+05	1.04E+05	2.42E+05	2.46E+05	3.02E+05	3.47E+05
1204.6	15.9	2	3.10E+05	3.91E+05	9.11E+04	2.16E+03	7.72E+05	8.05E+01	2.22E+05	9.99E+04	5.50E+04	8.96E+04	3.28E+05
2636.4	46.2	46	7.73E+05	7.70E+05	1.69E+06	6.45E+05	2.19E+06	2.18E+06	3.59E+05	1.46E+06	6.29E+05	7.41E+05	2.36E+06
2381.0	51.2	7	1.21E+05	1.84E+05	2.15E+05	1.52E+05	2.16E+05	2.22E+05	5.15E+04	1.39E+05	1.23E+05	1.43E+05	2.14E+05
1274.6	27.4	20	1.67E+05	2.87E+05	2.88E+05	2.49E+03	3.01E+05	2.61E+05	1.94E+05	6.95E+04	1.57E+05	1.56E+05	2.45E+05
4085.9	74.8	252	1.14E+06	4.30E+03	2.23E+04	9.09E+05	2.16E+04	9.68E+04	4.85E+02	1.09E+05	2.32E+05	4.58E+04	2.90E+05
2701.5	62.3	11	5.19E+04	3.59E+04	1.42E+05	6.64E+03	4.67E+04	5.46E+04	9.72E+02	3.60E+04	5.60E+03	1.03E+04	2.50E+05
1553.7	37.8	17	4.05E+05	3.77E+05	6.14E+05	2.26E+05	7.99E+05	7.16E+05	3.28E+05	2.77E+05	3.32E+05	3.54E+05	4.69E+05
1196.6	31.1	13	9.26E+04	9.17E+04	7.52E+04	5.66E+04	1.40E+05	1.24E+05	2.92E+04	3.06E+04	5.07E+04	8.03E+04	1.04E+05
1930.1	30.4	5	8.02E+04	7.69E+04	1.21E+05	3.78E+03	2.11E+05	1.73E+05	3.90E+04	9.04E+04	3.07E+04	3.59E+04	1.12E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.51E+05	1.33E+05	1.31E+05	2.18E+05	1.11E+05	1.97E+05	1.24	1.11E+00	3.28E-01	1.64	1.13E+00	7.46E-03	6.97E+04	1.14E+05
2.63E+06	3.23E+06	2.37E+06	4.32E+06	3.73E+06	3.29E+06	1.29	1.09E+00	2.27E-01	1.64	1.16E+00	1.07E-02	1.48E+06	2.43E+06
1.64E+06	8.61E+05	1.21E+06	1.70E+06	1.02E+06	3.02E+06	1.41	1.55E+00	2.51E-01	1.63	2.07E+00	1.26E-01	6.93E+05	1.13E+06
5.08E+05	1.05E+06	1.16E+06	8.41E+05	1.38E+06	6.62E+05	1.34	9.02E-01	1.42E-01	1.62	1.29E+00	3.06E-02	4.00E+05	6.49E+05
4.21E+05	5.19E+05	3.10E+05	6.51E+05	4.63E+05	9.01E+05	1.31	1.36E+00	3.09E-01	1.62	1.57E+00	6.26E-02	2.34E+05	3.79E+05
5.56E+06	5.77E+06	7.45E+06	8.48E+06	8.18E+06	5.03E+06	1.24	9.91E-01	2.88E-01	1.62	1.07E+00	6.08E-03	3.13E+06	5.06E+06
1.82E+05	1.75E+05	2.19E+05	3.90E+05	2.57E+05	5.58E+05	1.27	1.50E+00	4.33E-01	1.62	1.58E+00	8.72E-02	1.22E+05	1.97E+05
4.04E+05	2.95E+05	2.91E+05	3.31E+05	2.36E+05	4.54E+05	1.25	1.02E+00	2.69E-01	1.61	1.30E+00	2.18E-02	1.60E+05	2.57E+05
3.15E+05	5.65E+05	4.39E+05	9.44E+05	4.77E+05	4.68E+05	1.32	1.04E+00	2.09E-01	1.61	1.28E+00	3.74E-02	2.29E+05	3.69E+05
6.23E+05	7.76E+05	5.72E+05	9.09E+05	5.08E+05	1.61E+05	1.23	8.78E-01	3.10E-01	1.61	1.16E+00	5.20E-02	2.57E+05	4.13E+05
5.99E+04	3.35E+04	2.30E+04	8.41E+04	7.59E+04	3.84E+04	1.23	1.68E+00	5.41E-01	1.61	1.94E+00	1.16E-01	2.17E+04	3.48E+04
8.57E+04	1.59E+05	1.54E+05	3.47E+05	2.07E+05	3.90E+05	1.34	1.69E+00	3.72E-01	1.60	1.80E+00	1.32E-01	8.32E+04	1.33E+05
1.89E+04	1.04E+05	5.84E+04	6.05E+04	1.69E+05	8.34E+03	1.55	4.06E+00	4.74E-01	1.59	4.23E+00	4.54E-01	4.92E+04	7.82E+04
2.12E+05	2.45E+05	2.66E+05	4.72E+05	3.90E+05	1.31E+05	1.25	1.21E+00	3.51E-01	1.59	1.34E+00	3.76E-02	1.23E+05	1.95E+05
5.10E+06	5.45E+06	6.49E+06	7.81E+06	7.81E+06	5.11E+06	1.21	1.09E+00	3.98E-01	1.58	1.16E+00	1.60E-02	3.00E+06	4.73E+06
2.95E+05	2.02E+05	4.14E+05	5.37E+05	4.34E+05	1.82E+05	1.19	1.16E+00	4.58E-01	1.57	1.31E+00	3.51E-02	1.63E+05	2.55E+05
1.14E+05	2.78E+05	2.99E+05	3.28E+05	3.31E+05	2.51E+05	1.17	1.80E+00	6.94E-01	1.57	2.08E+00	1.57E-01	1.17E+05	1.84E+05
1.21E+06	1.38E+06	1.24E+06	1.66E+06	1.35E+06	1.44E+06	1.20	1.10E+00	4.27E-01	1.57	1.22E+00	2.55E-02	6.76E+05	1.06E+06
1.65E+05	1.79E+05	1.69E+05	2.30E+05	2.96E+05	1.57E+05	1.23	7.58E-01	1.90E-01	1.56	7.69E-01	1.28E-03	9.24E+04	1.44E+05
2.82E+05	1.45E+05	1.87E+05	2.29E+05	1.88E+05	4.28E+05	1.21	1.14E+00	4.06E-01	1.56	1.31E+00	4.09E-02	1.11E+05	1.73E+05
4.19E+05	3.80E+05	9.31E+05	6.84E+04	8.86E+04	3.88E+05	1.16	2.80E+00	8.01E-01	1.56	3.67E+00	4.40E-01	1.64E+05	2.55E+05
1.63E+04	1.86E+04	3.85E+03	4.36E+03	8.49E+04	1.85E+04	1.20	3.22E+00	8.00E-01	1.56	4.05E+00	5.79E-01	2.32E+04	3.62E+04
5.98E+05	4.19E+05	5.54E+05	9.45E+05	5.42E+05	3.57E+05	1.17	9.51E-01	4.33E-01	1.55	1.03E+00	2.38E-02	2.58E+05	3.99E+05
4.85E+04	8.82E+04	6.53E+04	8.37E+04	1.12E+05	1.46E+05	1.18	9.92E-01	4.13E-01	1.55	9.82E-01	9.48E-03	4.33E+04	6.70E+04
6.47E+04	1.04E+05	7.22E+04	2.21E+05	1.25E+05	1.35E+05	1.19	1.48E+00	5.78E-01	1.55	1.57E+00	9.34E-02	5.07E+04	7.83E+04

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Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
755493733	Complement component 4 binding protein	2	LACLNGTVLR	Carbamidomethyl(3)Deamidated(5)	3.07	2	559.3
569008736	Sodium/hydrogen exchanger	1	AFSTLLVNVSGK	Deamidated(8)	3.07	2	618.8
6753138	Sodium/potassium-transporting ATPase subunit	4	YLQPLLAVQFTNLTVDTEIR	Deamidated(12)	5.11	3	779.1
575771903	Inter alpha-trypsin inhibitor, heavy chain 4	5	AFITNFSMIIDGVTPGVVK	Deamidated(5)Oxidation(8)	3.75	2	1095.1
568926396	Tenascin	12	EEFWLGLDNLSK	Deamidated(9)	3.14	2	726.4
27734196	Cartilage intermediate layer protein	2	LPHDCFQNASNSFYVDVGR	Carbamidomethyl(5)Deamidated(8)	6.96	3	764.3
116014342	Basigin	4	SQLTISNLDVNVDPGTYVCNATNAQGTTR	Carbamidomethyl(19)Deamidated(20)	7.03	3	1037.5
6754186	Beta-hexosaminidase subunit beta	1	TQVFGPVDPTVNTTYAFFNTFFK	Deamidated(12)	3.51	3	881.4
31982171	Murinoglobulin-1	4	EVNSQLDNNGCSTQEVNITELQSK	Carbamidomethyl(11)Deamidated(8)Deamidated(17)	5.33	3	903.7
13507644	Carboxypeptidase N catalytic chain	2	IHILPSMNPDGVEVAAAQGNMSGYLVGR	Deamidated(21)Oxidation(7)Oxidation(22)	7.3	3	1030.8
568954529	Protocadherin Fat 1	6	GISYQLIGNHSK	Deamidated(9)	2.84	2	659.3
568991301	Plexin B2	10	VTVEGMEYVFYNDTK	Deamidated(12)Oxidation(6)	2.76	2	906.4
6753798	Prothrombin	2	YPHKPEINSTTHPGADLK	Deamidated(8)	4.19	4	502.3
111378397	phosphatidylinositol-glycan-specific phospholipase D	3	VNGTLTQVLLVGAPTHDDVSK	Deamidated(2)	6.91	3	722.4
45504394	Integrin beta-1	7	NGVNGTGENGR	Deamidated(1)Deamidated(4)Deamidated(9)	2.73	2	538.7
31791059	CD166 antigen	3	TVNSLNVSAISIEPHDEADDISDENR	Deamidated(6)	6.89	3	947.8
6754950	Alpha-1-acid glycoprotein 2	1	EYHTIDDHCVYNSTHLGIQR	Carbamidomethyl(9)Deamidated(12)	3.92	4	615.5
22122339	Pituitary tumor-transforming gene 1 protein-interacting protein	1	VGCSEYTNR	Carbamidomethyl(3)Deamidated(8)	2.75	2	543.7
568915857	Phospholipid transfer protein	4	VSNVSCEASVSK	Carbamidomethyl(6)Deamidated(3)	3.98	2	634.3
31982278	Lipase, hepatic	1	IPITLGEIGTSNK	Deamidated(12)	3.05	2	672.4
19526900	cell cycle control protein 50A	2	RDDLHPTLPAGQYFLNITYNYPVHSFDGR	Deamidated(16)	7.42	4	852.7
575771903	Inter alpha-trypsin inhibitor, heavy chain 4	5	HLQMDIYIFEPQGISILETESTFMTPELANALTTSQNK	Deamidated(30)Deamidated(37)Oxidation(4)Oxidation(24)	6.95	3	1448.7
755493733	Complement component 4 binding protein	2	LVGSPFIGCTVVNK	Carbamidomethyl(9)Deamidated(13)	2.81	2	746.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1117.6	36.9	14	9.53E+05	1.22E+06	1.44E+06	4.99E+05	1.77E+06	1.83E+06	4.81E+05	3.42E+05	6.08E+05	6.85E+05	1.60E+06
1236.7	47.3	16	1.11E+05	1.15E+05	2.10E+05	8.16E+04	3.28E+05	2.92E+05	7.63E+04	2.59E+05	1.08E+05	1.23E+05	3.35E+05
2335.3	66.7	84	4.02E+05	3.05E+05	1.27E+06	3.83E+05	8.18E+05	6.75E+05	1.63E+05	8.56E+05	2.30E+05	1.18E+05	5.12E+05
2189.1	62.1	191	2.63E+06	7.75E+06	7.49E+06	3.09E+06	1.07E+07	1.00E+07	2.14E+06	5.03E+06	8.97E+06	3.29E+06	8.83E+06
1451.7	58.7	5	9.97E+04	1.04E+05	2.77E+05	1.42E+05	3.93E+05	3.25E+05	2.86E+04	2.63E+05	1.12E+05	8.92E+04	3.22E+05
2291.0	40.8	5	2.41E+05	2.72E+05	4.26E+05	1.46E+05	6.41E+05	5.46E+05	2.40E+05	2.82E+05	1.57E+05	2.41E+05	5.32E+05
3110.5	52.7	71	7.28E+05	5.91E+05	1.63E+06	4.02E+05	2.21E+06	1.93E+06	2.78E+05	1.03E+06	7.29E+05	5.94E+05	2.36E+06
2642.3	75.0	35	1.52E+03	1.19E+05	5.53E+03	1.75E+03	2.18E+03	2.21E+05	1.67E+03	1.36E+05	4.12E+02	2.51E+02	1.13E+03
2709.2	39.9	23	1.46E+05	3.55E+05	4.46E+05	1.56E+05	3.49E+05	3.26E+05	1.61E+05	7.25E+04	2.18E+05	1.86E+05	3.69E+05
3090.5	44.1	6	4.20E+04	6.16E+04	1.04E+05	3.60E+04	1.00E+05	1.32E+05	1.07E+04	1.30E+04	4.24E+04	5.02E+04	1.22E+05
1317.7	30.8	3	1.12E+05	1.78E+05	2.05E+05	8.12E+04	1.98E+05	2.14E+05	9.20E+04	1.44E+05	9.58E+04	8.06E+04	1.84E+05
1811.8	42.0	16	5.02E+05	7.51E+05	6.98E+05	3.39E+05	7.77E+05	7.83E+05	3.67E+05	5.61E+05	4.92E+05	4.33E+05	7.96E+05
2006.0	22.0	16	4.71E+05	7.23E+05	7.07E+05	7.87E+04	1.27E+06	1.14E+06	6.90E+05	2.95E+05	6.91E+05	4.05E+05	8.49E+05
2165.1	47.0	37	1.51E+06	1.81E+06	2.87E+06	1.23E+06	3.23E+06	3.42E+06	1.34E+06	1.30E+06	2.62E+06	9.13E+05	3.04E+06
1076.5	16.1	46	1.56E+05	2.97E+04	4.60E+04	1.99E+02	7.37E+05	1.57E+06	3.83E+05	5.04E+04	3.62E+04	3.46E+04	1.31E+05
2841.3	43.8	11	7.41E+04	1.34E+05	1.14E+05	5.34E+04	1.33E+05	1.26E+05	6.82E+04	1.02E+05	7.22E+04	4.08E+04	1.13E+05
2459.1	30.5	7	3.59E+04	5.46E+04	5.77E+04	2.06E+05	1.25E+05	9.58E+04	7.04E+04	7.93E+04	8.44E+04	6.59E+04	1.25E+05
1086.5	17.7	7	1.02E+05	1.42E+05	1.88E+05	6.32E+03	2.17E+05	2.88E+04	1.59E+05	1.63E+05	6.89E+04	6.34E+04	1.75E+05
1267.6	20.5	20	4.18E+05	3.23E+05	6.60E+05	0.00E+00	1.12E+06	1.01E+06	5.30E+05	3.23E+05	2.25E+05	1.67E+05	7.91E+05
1343.7	41.8	8	6.24E+04	1.80E+05	1.86E+05	6.19E+04	3.03E+05	3.43E+05	6.93E+04	6.56E+04	8.37E+04	6.68E+04	1.62E+05
3407.6	53.4	26	1.30E+05	1.48E+05	2.31E+05	7.53E+04	1.95E+05	1.58E+05	1.57E+03	1.40E+05	1.07E+05	6.32E+04	1.61E+05
4344.1	65.5	49	1.77E+05	5.12E+05	8.79E+05	2.65E+05	8.39E+05	6.35E+05	8.07E+04	3.75E+05	2.54E+05	6.76E+04	3.16E+05
1491.8	44.1	17	3.60E+05	5.96E+05	8.92E+05	2.50E+05	8.53E+05	8.25E+05	2.54E+05	1.71E+05	3.02E+05	3.68E+05	7.11E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.23E+06	1.12E+06	1.14E+06	8.84E+05	7.49E+05	1.84E+06	1.14	1.04E+00	5.65E-01	1.53	1.18E+00	3.37E-02	5.68E+05	8.70E+05
1.03E+05	1.70E+05	2.48E+05	2.85E+05	2.54E+05	1.74E+05	1.20	1.13E+00	4.20E-01	1.53	1.30E+00	4.96E-02	1.02E+05	1.56E+05
4.14E+05	2.51E+05	1.12E+06	1.14E+06	1.16E+06	8.15E+05	1.22	1.53E+00	5.26E-01	1.53	1.83E+00	1.80E-01	3.25E+05	4.97E+05
9.01E+06	4.67E+06	7.61E+06	1.23E+07	7.62E+06	1.19E+07	1.27	1.14E+00	2.88E-01	1.53	1.44E+00	7.14E-02	3.93E+06	6.00E+06
1.52E+05	1.91E+05	1.47E+05	3.77E+05	2.89E+05	2.99E+05	1.20	1.29E+00	4.83E-01	1.52	1.36E+00	6.27E-02	1.11E+05	1.68E+05
2.45E+05	3.90E+05	3.31E+05	4.04E+05	4.71E+05	3.66E+05	1.14	9.07E-01	5.20E-01	1.51	8.64E-01	7.57E-03	1.83E+05	2.76E+05
9.76E+05	8.87E+05	1.24E+06	1.22E+06	1.35E+06	1.09E+06	1.15	1.25E+00	6.07E-01	1.50	1.38E+00	8.76E-02	6.01E+05	9.00E+05
0.00E+00	2.07E+03	3.00E+03	2.94E+05	1.54E+05	1.44E+05	1.38	4.14E+00	6.76E-01	1.50	4.45E+00	6.05E-01	3.25E+04	4.86E+04
3.65E+05	2.84E+05	2.17E+05	2.22E+05	1.89E+05	4.24E+05	1.14	9.48E-01	5.27E-01	1.49	1.22E+00	5.70E-02	1.43E+05	2.14E+05
6.36E+04	2.51E+04	6.14E+04	7.61E+04	7.80E+04	5.92E+04	1.11	1.25E+00	7.07E-01	1.49	1.47E+00	1.08E-01	3.36E+04	4.99E+04
1.09E+05	1.14E+05	1.53E+05	3.10E+05	3.21E+05	1.28E+05	1.19	1.06E+00	4.65E-01	1.48	1.07E+00	7.07E-02	8.53E+04	1.26E+05
4.37E+05	7.44E+05	7.75E+05	6.79E+05	1.19E+06	4.84E+05	1.18	7.78E-01	3.35E-01	1.48	8.99E-01	2.18E-02	3.47E+05	5.13E+05
8.19E+05	6.12E+05	7.10E+05	8.83E+05	6.22E+05	1.34E+06	1.16	1.05E+00	5.13E-01	1.47	1.17E+00	5.24E-02	3.93E+05	5.78E+05
2.35E+06	1.25E+06	3.14E+06	3.66E+06	2.36E+06	3.76E+06	1.19	9.80E-01	4.00E-01	1.47	1.24E+00	7.79E-02	1.28E+06	1.88E+06
4.44E+04	6.10E+04	7.71E+05	9.31E+05	1.03E+05	7.00E+05	1.04	2.76E+00	9.55E-01	1.47	3.81E+00	5.47E-01	1.68E+05	2.47E+05
5.47E+04	1.30E+05	8.92E+04	1.63E+05	1.80E+05	1.65E+05	1.20	9.16E-01	3.77E-01	1.46	9.82E-01	4.73E-02	5.75E+04	8.39E+04
6.40E+04	3.17E+04	4.82E+04	6.72E+04	5.95E+04	4.00E+05	1.20	2.02E+00	7.10E-01	1.45	2.17E+00	4.15E-01	5.24E+04	7.62E+04
9.45E+04	1.23E+05	1.59E+05	2.09E+05	1.43E+05	1.41E+05	1.16	1.08E+00	5.28E-01	1.45	1.20E+00	7.19E-02	7.04E+04	1.02E+05
2.74E+05	3.38E+05	6.68E+05	6.31E+05	5.57E+05	1.09E+06	1.10	1.38E+00	7.49E-01	1.45	1.45E+00	1.53E-01	2.81E+05	4.07E+05
1.18E+05	1.15E+05	1.94E+05	1.72E+05	1.79E+05	3.13E+05	1.09	1.28E+00	7.55E-01	1.44	1.36E+00	1.16E-01	8.32E+04	1.20E+05
9.03E+04	1.45E+05	1.36E+05	2.49E+05	2.35E+05	1.45E+05	1.16	1.07E+00	5.15E-01	1.43	1.13E+00	7.65E-02	7.79E+04	1.11E+05
4.17E+05	1.94E+05	5.92E+05	9.86E+05	6.68E+05	7.82E+05	1.13	1.42E+00	7.04E-01	1.42	1.55E+00	2.22E-01	2.52E+05	3.59E+05
4.56E+05	5.52E+05	3.88E+05	4.63E+05	4.61E+05	8.75E+05	1.07	9.73E-01	7.71E-01	1.42	1.04E+00	5.49E-02	2.79E+05	3.98E+05

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
133778931	Sarcoplasmic reticulum histidine-rich calcium-binding proteinsarcoplasmic reticulum histidine-rich calcium-binding protein	1	EVGEEENVSEEVFR	Deamidated(6)	3.55	2	762.3
117320545	CD180 antigen	2	LINLTFDLTR	Deamidated(3)	3.37	2	660.4
6755987	Vitronectin	3	NISEGFSGIPDNVDAAFALPAHR	Deamidated(1)	6.01	3	800.4
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	TDEANCSVK	Carbamidomethyl(6)Deamidated(5)	3.07	2	512.7
148747546	Serine protease inhibitor A3K	4	YTGNASALLILPDQGR	Deamidated(4)	4.98	2	845.4
568915167	Plasma protease C1 inhibitor	1	DTYVNASQSLYGSSPR	Deamidated(5)	4.54	2	873.4
755504188	Exostosin-like 2	1	SALDSFTLIMQTYNR	Deamidated(14)Oxidation(10)	3.08	2	888.9
568991301	Plexin B2	10	IKQDLALSGNLSSLYAMTQDK	Deamidated(10)Oxidation(17)	5.28	3	771.7
340745359	Hemolytic complement-like	2	LEIVPIIYDNDLSLFVQTDK	Deamidated(10)	3.76	2	1112.1
31560699	Follistatin-related protein 1	2	FVEQNETAINITTYADQENNK	Deamidated(5)Deamidated(10)	3.3	3	815.4
6754698	Multiple inositol polyphosphate phosphatase 1	1	FLTDVERNETALYHVEAFK	Deamidated(8)	3.25	4	571.5
6679182	Alpha-1-acid glycoprotein 1	1	ESQTIGDQCQVYNSTHLGFQR	Carbamidomethyl(9)Deamidated(12)	6.34	3	781.0
755534805	N-acetylglucosamine-1-phosphotransferase	4	NPSTNVSVVFDTTK	Deamidated(5)	3.1	2	804.9
225735655	prosaposin	7	TNSSFIQGFVDHVK	Deamidated(2)	3.92	2	790.4
568987201	Zinc transporter ZIP14	2	SLLDHLHVGVRDQNVSPK	Deamidated(14)	4.74	3	691.4
148232950	carboxypeptidase Q	1	EVMNLLQPLNVTK	Deamidated(10)Oxidation(3)	3.61	2	758.4
568922892	UDP-GalNAc:beta-1,3-N-acetylgalactosaminyltransferase 1	1	QDFLDTYNNLTLK	Deamidated(8)	2.44	2	793.4
160333710	Serine protease inhibitor A3M	2	YTGNASALFILPDQGR	Deamidated(4)	4.44	2	862.4
225735655	prosaposin	7	FSELIVNNATEELLVK	Deamidated(7)Deamidated(8)	3.57	2	910.0
29244210	Inositol monophosphatase 3	1	QVALQTFGNQTSIIPAGGAGYK	Deamidated(9)	3.8	2	1111.6
568956156	G-protein coupled receptor 56	1	VTNLSDPVVLTFQHQPQPK	Deamidated(3)	4.93	3	717.0
568982433	Semaphorin-4D	1	AANYTSSLNLPDK	Deamidated(3)	2.83	2	697.8
116014342	Basigin	4	TSDTGEEEEAITNSTEANGK	Deamidated(12)	3.84	2	977.9
568996556	HEG homolog 1	1	TTFALASNVTLFLDLADR	Deamidated(8)	4.99	2	928.5
15375312	Complement component C9	1	GAGEVSPAETHSSKPTNISAK	Deamidated(16)	4.9	4	492.7
171846253	Transmembrane glycoprotein NMB	6	VSINTVNLTAGPQVMEVTVFR	Deamidated(4)Deamidated(7)Oxidation(15)	3.28	2	1146.1
113205065	Tissue inhibitor of metalloproteinase 1	1	FMGSPEINETTLYQR	Deamidated(8)Oxidation(2)	4.41	2	901.9
226054321	Receptor-type tyrosine-protein phosphatase mu	1	FIASFNVVNTTK	Deamidated(9)	3.06	2	671.4
112293269	Integrin alpha 7	3	LWNSTFLEEYMAVK	Deamidated(3)Oxidation(11)	3.95	2	874.4

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1523.7	38.7	17	3.94E+05	2.15E+05	5.26E+05	1.58E+05	9.58E+05	8.55E+05	1.73E+05	3.80E+05	2.84E+05	4.21E+05	5.96E+05
1319.8	63.7	27	7.61E+05	1.14E+06	1.33E+06	4.26E+05	9.05E+05	7.85E+05	2.99E+05	7.47E+05	3.12E+05	1.89E+05	1.20E+06
2399.2	55.9	111	5.09E+06	1.08E+07	1.45E+07	4.94E+06	1.53E+07	1.32E+07	3.54E+06	4.90E+06	6.03E+06	5.45E+06	8.25E+06
1024.4	15.9	1	1.19E+05	2.21E+05	1.72E+05	0.00E+00	3.87E+05	1.07E+02	2.97E+05	1.12E+05	8.59E+04	4.21E+04	2.69E+05
1689.9	49.9	82	2.53E+06	5.60E+06	4.82E+06	4.40E+06	5.15E+06	4.09E+06	2.06E+06	1.26E+06	5.24E+06	3.29E+06	7.14E+06
1745.8	36.5	57	1.02E+06	1.23E+06	1.58E+06	8.50E+05	2.58E+06	2.24E+06	1.03E+06	8.68E+05	1.20E+06	9.18E+05	1.99E+06
1776.9	53.8	16	2.11E+05	1.78E+05	1.65E+05	2.30E+05	3.24E+05	3.37E+05	7.74E+04	1.96E+05	1.98E+05	1.88E+05	2.09E+05
2313.2	45.7	7	6.81E+05	9.60E+05	1.17E+06	4.42E+05	9.60E+05	9.66E+05	3.44E+05	7.28E+05	5.34E+05	4.00E+05	1.47E+06
2223.1	64.7	20	4.15E+04	1.14E+05	1.53E+05	5.87E+04	1.12E+05	1.01E+05	1.08E+04	3.29E+04	3.98E+04	1.77E+04	1.58E+05
2444.1	44.0	2	5.12E+05	3.92E+05	7.07E+05	2.09E+05	8.67E+05	8.89E+05	1.18E+05	4.76E+05	3.80E+05	3.18E+05	9.04E+05
2283.1	45.2	5	4.23E+04	5.95E+04	6.61E+04	1.36E+04	8.85E+04	1.06E+05	1.33E+04	4.30E+04	1.74E+04	2.33E+04	3.47E+04
2341.1	37.5	16	2.41E+05	3.59E+05	4.44E+05	1.81E+05	6.77E+05	6.68E+05	2.40E+05	2.96E+05	2.45E+05	3.33E+05	5.47E+05
1608.8	44.1	7	6.82E+04	9.58E+04	1.09E+05	4.66E+04	9.52E+04	1.16E+05	4.74E+04	6.38E+04	5.26E+04	5.12E+04	1.92E+05
1579.8	45.8	30	1.71E+06	2.26E+06	3.04E+06	6.69E+05	4.16E+06	3.85E+06	1.65E+06	2.09E+06	1.21E+06	1.14E+06	2.79E+06
2072.1	35.2	2	1.42E+05	6.72E+04	1.15E+05	5.71E+04	1.38E+05	1.67E+05	3.73E+04	7.03E+04	4.73E+04	7.41E+04	2.80E+05
1515.8	47.2	17	2.79E+05	2.18E+05	3.17E+05	1.27E+05	4.63E+05	5.00E+05	1.30E+05	1.71E+05	1.45E+05	2.17E+05	3.08E+05
1585.8	51.7	1	1.96E+05	6.40E+04	2.01E+05	2.10E+05	2.37E+05	2.54E+05	2.71E+04	2.37E+05	1.44E+05	1.76E+05	2.18E+05
1723.9	52.2	33	3.12E+05	7.59E+05	1.02E+06	5.08E+05	1.34E+06	1.06E+06	4.92E+05	6.21E+05	1.30E+06	4.64E+05	8.50E+05
1819.0	54.1	363	5.13E+06	9.22E+06	1.43E+07	3.64E+06	1.39E+07	1.20E+07	2.99E+06	6.48E+06	4.52E+06	2.36E+06	1.10E+07
2222.1	47.8	6	8.64E+04	1.56E+04	1.07E+05	6.24E+04	2.14E+05	2.67E+05	4.10E+04	1.15E+05	1.06E+05	8.94E+04	1.80E+05
2149.1	41.5	6	6.97E+04	7.02E+04	1.06E+05	4.37E+04	1.65E+05	1.49E+05	5.17E+04	6.41E+04	5.18E+04	8.13E+04	9.35E+04
1394.7	35.5	2	2.83E+05	1.47E+05	2.85E+05	1.85E+05	4.29E+05	4.00E+05	1.12E+05	2.90E+05	2.51E+05	2.17E+05	3.04E+05
1954.8	25.5	198	1.63E+05	4.05E+04	5.65E+04	2.19E+04	3.58E+05	3.25E+05	4.02E+04	1.43E+05	8.53E+04	1.01E+05	1.81E+05
1855.9	63.1	3	1.26E+05	2.17E+05	3.53E+05	8.15E+04	2.08E+05	2.94E+05	3.08E+04	2.42E+05	8.81E+04	4.55E+04	1.37E+05
1968.0	19.9	26	4.72E+05	6.88E+05	6.05E+05	0.00E+00	4.73E+05	9.95E+04	1.80E+05	1.26E+05	1.60E+05	1.61E+05	5.00E+05
2291.2	51.8	297	1.42E+07	2.56E+07	2.46E+07	6.28E+06	3.07E+07	2.77E+07	8.94E+06	1.89E+07	6.76E+06	7.86E+06	1.95E+07
1802.8	38.9	22	3.30E+05	6.16E+05	6.82E+05	3.36E+05	1.02E+06	9.99E+05	2.95E+05	3.01E+05	4.51E+05	3.74E+05	5.77E+05
1341.7	44.3	7	5.73E+04	7.06E+04	1.88E+05	6.30E+04	2.30E+05	1.84E+05	3.49E+04	1.23E+05	6.49E+04	6.72E+04	1.51E+05
1747.8	54.7	9	4.83E+05	7.14E+05	4.68E+05	5.69E+05	1.28E+06	1.26E+06	3.53E+05	7.09E+05	4.76E+05	4.30E+05	8.32E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
4.16E+05	3.13E+05	5.08E+05	5.02E+05	4.90E+05	4.56E+05	1.06	8.93E-01	8.12E-01	1.42	9.96E-01	5.45E-02	2.46E+05	3.49E+05
5.37E+05	6.77E+05	5.91E+05	1.30E+06	1.04E+06	1.24E+06	1.14	1.09E+00	5.90E-01	1.41	1.19E+00	1.14E-01	4.29E+05	6.07E+05
1.20E+07	6.63E+06	6.32E+06	1.52E+07	1.40E+07	7.39E+06	1.08	1.02E+00	7.34E-01	1.41	1.13E+00	9.44E-02	4.94E+06	6.99E+06
8.21E+04	1.74E+05	1.74E+05	2.64E+05	1.54E+05	2.09E+05	1.10	1.44E+00	7.60E-01	1.41	1.57E+00	2.11E-01	8.83E+04	1.24E+05
5.11E+06	5.64E+06	2.37E+06	3.96E+06	2.41E+06	4.84E+06	1.11	8.70E-01	5.85E-01	1.41	1.35E+00	1.58E-01	2.36E+06	3.31E+06
1.42E+06	1.10E+06	1.34E+06	1.71E+06	1.39E+06	2.33E+06	1.09	8.15E-01	6.36E-01	1.41	8.09E-01	2.37E-02	8.04E+05	1.13E+06
2.15E+05	1.75E+05	2.48E+05	4.03E+05	3.36E+05	9.59E+04	1.10	8.61E-01	6.39E-01	1.40	9.97E-01	8.05E-02	1.25E+05	1.75E+05
5.82E+05	7.41E+05	6.95E+05	1.10E+06	8.11E+05	8.99E+05	1.11	8.48E-01	5.85E-01	1.39	9.48E-01	7.06E-02	4.42E+05	6.16E+05
7.11E+04	5.88E+04	5.33E+04	8.23E+04	5.51E+04	1.39E+05	1.08	1.33E+00	8.10E-01	1.39	1.54E+00	2.46E-01	4.15E+04	5.78E+04
3.58E+05	4.25E+05	5.44E+05	8.21E+05	6.13E+05	4.25E+05	1.09	1.01E+00	7.06E-01	1.39	1.08E+00	9.27E-02	2.92E+05	4.07E+05
4.29E+04	5.15E+04	4.98E+04	1.11E+05	5.43E+04	5.45E+04	1.06	1.22E+00	8.49E-01	1.39	1.34E+00	1.71E-01	2.78E+04	3.87E+04
3.37E+05	3.56E+05	2.40E+05	4.12E+05	2.47E+05	6.89E+05	1.06	9.44E-01	7.88E-01	1.39	9.64E-01	7.14E-02	2.12E+05	2.95E+05
4.94E+04	7.02E+04	6.42E+04	8.19E+04	8.25E+04	8.37E+04	1.09	9.73E-01	7.04E-01	1.39	1.10E+00	1.69E-01	4.48E+04	6.23E+04
1.99E+06	2.44E+06	1.92E+06	3.49E+06	2.77E+06	3.05E+06	1.07	8.72E-01	7.48E-01	1.38	8.25E-01	3.47E-02	1.30E+06	1.80E+06
5.35E+04	3.33E+04	1.07E+05	9.81E+04	7.79E+04	5.66E+04	1.04	1.36E+00	9.00E-01	1.38	1.60E+00	3.57E-01	5.27E+04	7.28E+04
2.20E+05	2.75E+05	2.35E+05	3.48E+05	2.21E+05	3.33E+05	1.03	7.67E-01	8.70E-01	1.38	7.56E-01	2.65E-02	1.46E+05	2.02E+05
1.55E+05	1.31E+05	1.73E+05	3.76E+05	1.70E+05	1.06E+05	1.08	9.71E-01	7.34E-01	1.38	1.19E+00	1.50E-01	1.03E+05	1.41E+05
9.68E+05	6.69E+05	8.03E+05	1.62E+06	1.14E+06	1.10E+06	1.16	9.46E-01	4.75E-01	1.37	1.29E+00	1.69E-01	5.09E+05	6.99E+05
1.04E+07	5.89E+06	6.28E+06	1.36E+07	9.74E+06	8.55E+06	1.06	1.02E+00	8.17E-01	1.37	1.14E+00	1.44E-01	4.55E+06	6.24E+06
1.12E+05	7.72E+04	2.07E+05	1.42E+05	9.33E+04	2.38E+04	1.03	1.26E+00	9.32E-01	1.37	1.60E+00	2.86E-01	6.52E+04	8.92E+04
8.65E+04	5.79E+04	8.04E+04	1.23E+05	8.89E+04	8.97E+04	1.02	7.40E-01	9.04E-01	1.37	7.62E-01	3.05E-02	4.82E+04	6.60E+04
2.13E+05	1.98E+05	3.75E+05	4.45E+05	3.74E+05	1.58E+05	1.08	8.26E-01	6.91E-01	1.37	9.98E-01	9.75E-02	1.56E+05	2.14E+05
1.03E+05	7.68E+04	1.96E+05	1.78E+05	1.74E+05	1.14E+05	1.02	1.28E+00	9.42E-01	1.36	1.45E+00	2.36E-01	7.69E+04	1.05E+05
6.45E+04	2.51E+05	2.21E+05	2.39E+05	4.05E+05	2.54E+05	1.11	1.29E+00	7.23E-01	1.36	1.45E+00	2.56E-01	1.06E+05	1.44E+05
3.41E+05	4.73E+05	1.68E+05	2.80E+05	2.32E+05	4.57E+05	1.05	1.28E+00	8.79E-01	1.36	1.60E+00	2.82E-01	1.80E+05	2.45E+05
1.33E+07	1.81E+07	1.49E+07	3.57E+07	2.32E+07	2.19E+07	1.06	1.01E+00	7.95E-01	1.36	1.06E+00	1.20E-01	1.03E+07	1.40E+07
4.69E+05	4.48E+05	4.99E+05	8.55E+05	7.38E+05	7.50E+05	1.05	8.55E-01	7.94E-01	1.36	7.96E-01	4.68E-02	3.19E+05	4.33E+05
8.56E+04	1.35E+05	8.49E+04	1.51E+05	1.39E+05	1.22E+05	1.04	9.45E-01	8.75E-01	1.36	9.77E-01	9.59E-02	6.38E+04	8.65E+04
6.10E+05	5.50E+05	7.02E+05	1.36E+06	9.61E+05	4.71E+05	1.05	9.53E-01	8.12E-01	1.35	9.80E-01	1.07E-01	4.03E+05	5.46E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
6754164	Complement C5	1	SITHDTDGVAVFVLNLPSNVTVLK	Deamidated(19)	6.85	3	847.5
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	SLDNDNYVFTAPYFNK	Deamidated(15)	4.31	2	954.9
568915857	Phospholipid transfer protein	4	GHFYINISDVR	Deamidated(6)	3.79	2	686.3
156616286	Collagen alpha-6(VI) chain	11	TEFNLTYSYSSK	Deamidated(4)	3.91	2	639.3
568995969	Fetuin-B	1	VLYLPAYNCTLRPVSK	Carbamidomethyl(9)Deamidated(8)	4.35	3	632.3
340745359	Hemolytic complement-like	2	VGAPENVTVQAHGHTAEFDTTVSVK	Deamidated(6)	5.54	4	649.6
755495403	Antithrombin-III	3	LGACNDTLK	Carbamidomethyl(4)Deamidated(5)	2.54	2	496.7
122937370	Multimerin-2	4	FNTTSINVGSSYFPEHGYFR	Deamidated(2)	6.28	3	775.4
113195678	Lysosomal-associated membrane protein 1	7	ALELQFGMNASSSLFFLQGVK	Deamidated(9)Oxidation(8)	4.76	3	778.1
568935054	Alpha-type platelet-derived growth factor receptor	1	IVQLNSSFSLR	Deamidated(5)	3.16	2	632.8
161016843	Desmoglein-2	4	NTGELNITSILDREETPYFLLTGYALDSR	Deamidated(1)Deamidated(6)	5.74	3	1101.6
31543108	Lysosome-associated membrane glycoprotein 2	4	EASHYSIHDIVLSYNTSDSTVFPGAVAK	Deamidated(15)	8.48	4	753.1
506326690	Prion-like protein doppel	1	EMLVTSCVNATQAANQAEFSR	Carbamidomethyl(7)Deamidated(9)Oxidation(2)	5.77	3	782.0
27370240	Leucyl-cystinyl aminopeptidase	8	LPTAIPLCYELSLHPNLTSMTFR	Carbamidomethyl(9)Deamidated(17)Oxidation(21)	5.76	3	935.5
568920137	Laminin subunit alpha-5	15	GDTVAPGSEGLLNLPDDFVFYVGGYPSNFTPPEPLR	Deamidated(29)	6.01	3	1326.0
11230798	Programmed cell death 1 ligand 1	1	TEGMLLNVTSSLR	Deamidated(7)Oxidation(4)	3.81	2	719.4
113195678	Lysosomal-associated membrane protein 1	7	YSVQHMYFTYNLSDTEHFPNAISK	Deamidated(11)Deamidated(20)Oxidation(6)	4.64	4	727.8
170295823	Vascular cell adhesion protein 1	1	QLNNGELQPLSENTTLTFMSTK	Deamidated(4)Deamidated(13)Oxidation(19)	3.57	2	1242.6
6755987	Vitronectin	3	NGSLFAFR	Deamidated(1)	2.51	2	456.7
30520239	Neutral cholesterol ester hydrolase 1	1	GNYDFVEAMIVNNHTSLDVER	Deamidated(12)Deamidated(13)Oxidation(9)	7.93	3	814.0
225735655	prosaposin	7	LVLYLEHNLEKNSTK	Deamidated(12)	4.89	3	601.3
41282022	Calumenin isoform 2	1	NVTYGTYLDDPDPDDGFNYK	Deamidated(1)	4.9	2	1155.5
117168301	Laminin subunit alpha-1	1	AFMTVDGQESPSVTVVGNATTLDV ER	Deamidated(18)Oxidation(3)	4.67	3	914.1
9055172	ATPase, H+ transporting, lysosomal accessory protein	2	LNASLPALLIR	Deamidated(2)	3.84	2	647.9
156616286	Collagen alpha-6(VI) chain	11	LGNFSELATHNQTFK	Deamidated(3)Deamidated(11)	6.14	3	608.0

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2540.4	62.1	28	3.69E+05	6.08E+05	7.81E+05	3.34E+05	6.28E+05	5.12E+05	6.24E+04	1.65E+05	2.82E+05	1.67E+05	6.64E+05
1908.9	51.5	28	3.13E+05	2.43E+05	4.62E+05	1.78E+05	7.41E+05	7.51E+05	1.71E+05	4.94E+05	3.10E+05	3.22E+05	7.13E+05
1371.6	35.3	33	5.50E+05	6.47E+05	9.30E+05	3.04E+05	1.48E+06	1.31E+06	5.23E+05	4.86E+05	4.56E+05	3.41E+05	9.56E+05
1277.6	37.1	24	8.66E+05	7.31E+05	1.49E+06	6.69E+05	1.97E+06	1.90E+06	7.61E+05	1.04E+06	6.34E+05	8.45E+05	1.45E+06
1895.0	42.6	19	2.27E+05	4.74E+05	5.15E+05	1.60E+05	9.53E+05	8.10E+05	2.33E+05	2.36E+05	2.46E+05	2.20E+05	5.65E+05
2595.3	32.0	2	3.89E+04	8.74E+04	1.08E+05	5.48E+04	8.19E+04	8.68E+04	1.11E+04	4.68E+04	4.49E+04	3.12E+04	9.20E+04
992.5	24.1	15	3.92E+05	9.33E+05	1.00E+06	5.40E+03	1.97E+06	1.92E+06	3.37E+05	1.82E+05	2.11E+05	2.11E+05	3.94E+05
2324.1	47.3	17	3.09E+05	2.84E+05	5.11E+05	2.29E+05	8.49E+05	8.06E+05	1.82E+05	3.94E+05	2.27E+05	2.66E+05	4.76E+05
2332.2	65.2	57	2.00E+05	3.13E+05	6.00E+05	1.67E+05	2.69E+05	1.66E+05	4.57E+04	2.72E+05	6.86E+04	3.85E+04	1.55E+05
1264.7	43.8	4	4.49E+04	5.52E+04	9.21E+04	4.41E+04	4.52E+04	6.67E+04	4.50E+03	1.02E+05	3.26E+04	0.00E+00	1.11E+05
3302.6	69.4	12	4.72E+04	2.81E+04	1.68E+05	2.87E+04	1.65E+05	1.59E+05	4.87E+03	9.34E+04	3.30E+04	1.82E+04	6.54E+04
3009.5	48.0	69	4.44E+06	3.88E+06	5.05E+06	2.30E+06	5.69E+06	4.80E+06	9.23E+05	3.14E+06	1.96E+06	2.09E+06	4.48E+06
2344.1	38.1	21	2.08E+05	2.29E+05	2.96E+05	1.48E+05	4.00E+05	3.80E+05	1.77E+05	2.10E+05	1.13E+05	1.59E+05	3.34E+05
2804.4	59.8	15	3.10E+05	3.25E+05	8.05E+05	1.45E+05	6.04E+05	5.34E+05	4.65E+04	3.99E+05	1.91E+05	8.32E+04	5.33E+05
3975.9	67.2	17	9.82E+04	1.08E+05	2.72E+05	4.85E+04	2.38E+05	1.72E+05	3.16E+03	1.35E+05	6.91E+04	5.35E+04	1.63E+05
1437.7	43.5	10	1.18E+05	1.03E+05	2.07E+05	6.51E+04	1.89E+05	1.33E+05	8.30E+04	1.01E+05	7.45E+04	9.00E+04	2.36E+05
2908.3	41.8	175	1.18E+07	1.26E+07	1.83E+07	6.60E+06	1.80E+07	1.62E+07	4.62E+06	1.07E+07	7.45E+06	6.74E+06	1.36E+07
2484.2	49.6	2	6.81E+04	1.13E+05	1.62E+05	5.97E+04	1.05E+05	1.22E+05	4.30E+04	8.94E+04	6.39E+04	5.41E+04	9.02E+04
912.5	50.8	13	4.42E+05	6.80E+05	7.75E+05	4.55E+05	9.63E+05	9.16E+05	3.44E+05	2.93E+05	5.31E+05	4.97E+05	5.31E+05
2440.1	45.4	110	2.72E+06	1.84E+06	3.68E+06	1.23E+06	4.79E+06	4.31E+06	7.04E+05	2.61E+06	1.62E+06	1.53E+06	4.08E+06
1802.0	34.3	48	7.61E+05	9.19E+05	9.62E+05	4.09E+05	1.70E+06	1.58E+06	4.15E+05	7.18E+05	2.97E+05	4.36E+05	9.87E+05
2310.0	50.3	8	2.04E+05	4.21E+05	3.08E+05	1.20E+05	5.55E+05	4.46E+05	1.92E+05	2.03E+05	1.31E+05	1.12E+05	2.50E+05
2740.3	47.6	6	1.26E+05	2.53E+05	2.40E+05	1.15E+05	1.65E+05	1.86E+05	3.24E+04	5.51E+04	2.75E+04	8.51E+04	1.34E+05
1294.8	62.9	17	2.09E+05	2.87E+05	4.32E+05	1.43E+05	4.48E+05	4.76E+05	8.20E+04	2.75E+05	2.01E+05	1.57E+05	3.74E+05
1821.9	44.5	32	1.01E+06	1.24E+06	2.52E+06	7.41E+05	3.20E+06	3.02E+06	8.86E+05	1.98E+06	9.24E+05	1.14E+06	2.44E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
4.30E+05	3.60E+05	2.92E+05	5.23E+05	3.34E+05	7.09E+05	1.05	1.04E+00	8.53E-01	1.35	1.16E+00	1.64E-01	2.36E+05	3.19E+05
2.97E+05	3.14E+05	4.39E+05	4.96E+05	5.21E+05	3.10E+05	1.05	9.31E-01	8.33E-01	1.34	1.04E+00	1.26E-01	2.37E+05	3.18E+05
4.53E+05	5.22E+05	8.57E+05	8.90E+05	9.48E+05	1.21E+06	1.04	9.75E-01	8.70E-01	1.34	9.22E-01	9.09E-02	4.17E+05	5.61E+05
8.39E+05	1.14E+06	1.04E+06	1.57E+06	1.06E+06	1.13E+06	1.02	7.16E-01	9.31E-01	1.34	6.97E-01	2.94E-02	6.32E+05	8.49E+05
3.69E+05	3.72E+05	4.12E+05	6.96E+05	2.57E+05	5.48E+05	1.00	1.05E+00	9.89E-01	1.34	1.10E+00	1.51E-01	2.38E+05	3.19E+05
5.52E+04	4.39E+04	5.64E+04	8.54E+04	4.66E+04	1.16E+05	1.06	9.83E-01	8.05E-01	1.34	1.05E+00	1.46E-01	3.61E+04	4.83E+04
4.19E+05	9.06E+05	1.02E+06	8.56E+05	4.35E+05	1.74E+06	0.97	1.57E+00	9.36E-01	1.34	1.90E+00	4.04E-01	4.09E+05	5.47E+05
4.07E+05	3.42E+05	4.72E+05	5.93E+05	4.67E+05	3.45E+05	1.00	8.38E-01	9.97E-01	1.33	8.85E-01	8.60E-02	2.36E+05	3.15E+05
1.49E+05	1.30E+05	1.74E+05	5.15E+05	4.84E+05	3.79E+05	1.08	1.53E+00	8.18E-01	1.33	1.68E+00	3.80E-01	1.33E+05	1.77E+05
3.16E+04	5.63E+04	3.24E+04	1.22E+05	4.08E+04	9.41E+04	1.13	1.42E+00	7.14E-01	1.33	1.71E+00	4.02E-01	3.27E+04	4.33E+04
5.72E+04	2.98E+04	9.49E+04	1.66E+05	1.61E+05	7.43E+04	1.03	1.53E+00	9.34E-01	1.32	1.71E+00	3.80E-01	4.48E+04	5.94E+04
3.14E+06	3.06E+06	2.84E+06	6.20E+06	3.84E+06	3.63E+06	1.02	8.07E-01	9.03E-01	1.32	8.13E-01	7.49E-02	2.04E+06	2.70E+06
2.24E+05	2.27E+05	1.52E+05	2.82E+05	1.91E+05	3.55E+05	1.00	7.33E-01	9.90E-01	1.32	7.02E-01	4.93E-02	1.35E+05	1.79E+05
1.84E+05	3.29E+05	3.70E+05	5.53E+05	6.56E+05	4.28E+05	1.05	1.19E+00	8.62E-01	1.32	1.27E+00	2.47E-01	2.13E+05	2.80E+05
7.85E+04	1.16E+05	1.06E+05	2.13E+05	1.61E+05	1.54E+05	1.03	1.12E+00	9.20E-01	1.31	1.16E+00	2.14E-01	7.23E+04	9.48E+04
7.15E+04	8.55E+04	1.10E+05	1.46E+05	1.26E+05	9.73E+04	1.01	8.61E-01	9.64E-01	1.31	9.23E-01	1.65E-01	6.82E+04	8.93E+04
9.88E+06	1.08E+07	1.01E+07	1.95E+07	1.36E+07	1.22E+07	1.02	7.50E-01	9.06E-01	1.31	7.37E-01	6.21E-02	6.79E+06	8.89E+06
6.82E+04	8.09E+04	6.46E+04	2.10E+05	1.51E+05	5.27E+04	1.05	1.03E+00	8.44E-01	1.31	1.11E+00	2.44E-01	5.37E+04	7.03E+04
1.03E+06	4.70E+05	5.03E+05	6.79E+05	4.61E+05	5.07E+05	0.97	7.15E-01	8.85E-01	1.31	1.05E+00	2.18E-01	3.46E+05	4.52E+05
2.16E+06	1.91E+06	2.54E+06	3.56E+06	3.07E+06	2.16E+06	1.01	8.76E-01	9.80E-01	1.31	9.18E-01	1.29E-01	1.49E+06	1.95E+06
5.28E+05	8.83E+05	6.95E+05	1.53E+06	8.23E+05	9.15E+05	0.99	9.59E-01	9.54E-01	1.31	9.82E-01	1.56E-01	4.77E+05	6.24E+05
1.94E+05	2.96E+05	2.32E+05	5.97E+05	3.25E+05	3.07E+05	1.01	1.04E+00	9.73E-01	1.31	1.08E+00	2.13E-01	1.61E+05	2.10E+05
2.42E+05	7.23E+04	7.37E+04	1.11E+05	1.03E+05	1.87E+05	0.94	1.05E+00	8.35E-01	1.30	1.53E+00	3.67E-01	7.36E+04	9.60E+04
2.64E+05	2.04E+05	2.55E+05	3.95E+05	3.55E+05	3.19E+05	1.02	8.07E-01	9.07E-01	1.30	8.13E-01	9.35E-02	1.64E+05	2.14E+05
1.24E+06	1.71E+06	1.61E+06	2.14E+06	1.69E+06	1.73E+06	0.99	8.08E-01	9.74E-01	1.30	8.54E-01	1.14E-01	9.80E+05	1.28E+06

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568953122	Insulin receptor	4	SDIIVQTDATNPSVPLDPISVSNSS SQILK	Deamidated(24)	4.52	3	1134.9
568906655	Transmembrane protein 182	1	GEHNSTSYDSAIYR	Deamidated(4)	4.09	3	571.9
755532856	Laminin, alpha 2	17	NESGIILLGSGGTLTPPR	Deamidated(1)	4.94	2	892.0
114326497	Laminin subunit beta-1	6	QADEDIQGTQNLLTSIESETAASEET LTNASQR	Deamidated(11)Deamidated(29)	7.95	3	1184.6
9790019	Acid ceramidase	2	NLSFATIYDVLSTKPVLNK	Deamidated(1)	5.04	3	708.7
755504148	Lysosomal protein NCU-G1	2	LLEFDSTNASEGAQPPGKPYPPYSL AK	Deamidated(8)	5.71	3	960.1
219521935	Histocompatibility 2, Q region locus 4	2	EQNYTCHVHHEGLPEPLTLR	Carbamidomethyl(6)Deamidated(3)	4.26	3	811.1
568922760	Immunoglobulin superfamily member 10	6	ITVHQNGTLEIR	Deamidated(6)	3.09	3	461.3
568956041	Cadherin-13	6	NLSVVILGASDKDLHPNTDPFKFEIH K	Deamidated(1)	4.7	4	759.7
6755775	Transforming growth factor beta-1	2	DISHSIYMFNTSDIR	Deamidated(11)Oxidation(8)	4.52	3	655.0
22203747	Collagen alpha-2(VI) chain	6	MALLQYGSQNNQQVAFPLTYNVTTI HEALER	Deamidated(10)Deamidated(21)Oxidation(1)	5.71	4	895.7
568971816	Intercellular adhesion molecule 2	6	ETLKNQTFGGAETVPQEATATFNST ALK	Deamidated(5)Deamidated(23)	4.44	3	986.2
568983003	Cathepsin L	1	AEFAVANDTGFVDIPQKEK	Deamidated(7)	4.74	3	694.0
6753556	Cathepsin D	1	NGTSFDIHYGSGSLSGYLSQDTVSV PCK	Carbamidomethyl(27)Deamidated(1)	4.22	3	993.1
755509347	Mannan-binding lectin serine protease 2	2	VLATLCGQESTDTEQAPGNDFYSL GPSLK	Carbamidomethyl(6)Deamidated(19)	5.84	3	1067.5
148747408	Laminin subunit alpha-4	7	NLTEVVPQLLDQLR	Deamidated(1)	4.49	2	820.0
160333710	Serine protease inhibitor A3M	2	LLNDYVSNQTQGMK	Deamidated(8)Oxidation(13)	4.23	2	870.9
113195678	Lysosomal-associated membrane protein 1	7	GYLLTLNFTK	Deamidated(7)	2.82	2	585.8
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	EYCNDLKPSDNNTFLNFNEFIDR	Carbamidomethyl(3)Deamidated(11)	3.46	3	1036.8
110347469	Alpha-2-macroglobulin	5	VNLSFPSAQSLPASDTHLK	Deamidated(2)	5.26	3	671.7
237757322	Complement factor H-related protein	1	EFQHNMSTMYK	Deamidated(5)Oxidation(8)	2.77	2	732.8
568911077	Nicastrin	4	ALYELAGGTNFSSSIQADPQTVTR	Deamidated(10)	5.92	3	843.1
19526900	cell cycle control protein 50A	2	DDLHPTLPAGQYFLNITYNYPVHSF DGR	Deamidated(15)Deamidated(19)	7.98	4	813.6
568954797	Teneurin-3	2	LGGFTHENNTIDSGELDGR	Deamidated(9)	3.83	3	716.0
568991301	Plexin B2	10	LSHDGNETLPLHLYVK	Deamidated(6)	4.09	3	613.0
344217723	Agrin	1	NELMLNSSLMR	Deamidated(6)Oxidation(4)Oxidation(10)	3.12	2	670.8

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
3402.8	60.8	14	5.68E+04	4.91E+04	1.83E+05	3.77E+04	2.21E+05	2.00E+05	1.17E+04	1.31E+05	6.73E+04	3.30E+04	1.88E+05
1713.8	31.0	16	9.29E+04	7.41E+04	2.57E+05	6.31E+04	3.19E+05	2.62E+05	1.05E+05	1.52E+05	1.34E+05	1.07E+05	2.11E+05
1783.0	54.2	24	3.33E+05	4.74E+05	7.31E+05	1.80E+05	7.82E+05	6.78E+05	3.06E+05	3.96E+05	2.72E+05	3.00E+05	5.31E+05
3551.7	63.7	117	6.93E+05	8.48E+05	1.64E+06	5.30E+05	1.73E+06	1.58E+06	2.39E+05	7.64E+05	5.86E+05	5.26E+05	1.28E+06
2124.2	63.9	18	2.02E+05	3.27E+05	3.59E+05	7.92E+04	4.05E+05	3.89E+05	5.86E+04	3.05E+05	1.06E+05	9.16E+04	2.53E+05
2878.4	43.9	30	5.57E+05	5.62E+05	7.03E+05	2.86E+05	9.02E+05	7.99E+05	2.68E+05	4.25E+05	3.44E+05	3.88E+05	6.10E+05
2431.1	33.0	6	9.07E+04	1.36E+05	3.00E+05	4.30E+04	3.52E+05	3.44E+05	1.15E+05	8.04E+04	6.78E+04	7.80E+04	2.46E+05
1381.7	30.1	13	4.04E+05	7.46E+04	3.42E+05	2.57E+05	9.69E+05	1.07E+06	9.40E+04	3.42E+05	2.84E+05	4.44E+05	4.77E+05
3035.6	48.6	9	8.17E+04	6.23E+04	2.08E+05	6.58E+04	2.62E+05	2.36E+05	9.14E+03	1.65E+05	5.31E+04	7.33E+04	1.96E+05
1962.9	57.8	31	3.70E+05	6.64E+05	8.12E+05	2.98E+05	8.30E+05	7.36E+05	1.15E+05	4.84E+05	2.98E+05	3.51E+05	5.66E+05
3579.8	56.7	301	9.85E+06	9.58E+06	1.94E+07	9.07E+06	2.73E+07	2.45E+07	1.41E+06	1.87E+07	7.16E+06	5.24E+06	1.98E+07
2956.5	45.8	16	1.55E+05	1.63E+05	3.10E+05	9.24E+04	7.09E+05	6.08E+05	1.44E+05	4.64E+05	1.62E+05	1.81E+05	5.53E+05
2080.0	47.8	56	6.21E+05	7.45E+05	8.92E+05	3.48E+05	1.23E+06	1.04E+06	5.04E+05	4.61E+05	4.19E+05	4.01E+05	8.38E+05
2977.4	50.2	20	1.48E+05	1.83E+05	2.91E+05	7.95E+04	3.93E+05	3.82E+05	2.58E+04	1.80E+05	8.46E+04	4.89E+04	2.25E+05
3200.5	52.1	8	5.34E+04	1.25E+05	1.79E+05	5.95E+04	1.46E+05	1.75E+05	2.70E+04	5.01E+04	7.45E+04	5.83E+04	1.40E+05
1638.9	69.5	55	2.66E+05	4.70E+05	7.22E+05	1.82E+05	8.68E+05	7.21E+05	1.52E+05	4.77E+05	2.26E+05	1.56E+05	7.32E+05
1740.8	34.5	34	1.67E+05	3.27E+05	3.65E+05	2.17E+05	5.20E+05	4.80E+05	3.22E+05	1.86E+05	4.87E+05	2.11E+05	3.63E+05
1170.6	53.0	81	7.26E+06	9.27E+06	1.27E+07	4.35E+06	1.21E+07	1.24E+07	2.84E+06	9.60E+06	4.20E+06	3.26E+06	1.23E+07
3108.4	60.6	13	4.89E+04	5.36E+04	1.19E+05	1.97E+04	1.79E+05	1.63E+05	8.60E+03	9.49E+04	3.76E+04	1.98E+04	1.42E+05
2013.0	42.6	36	1.95E+06	3.00E+06	3.50E+06	2.27E+06	4.40E+06	3.58E+06	1.77E+06	2.63E+06	3.24E+06	1.60E+06	3.36E+06
1464.6	22.4	15	3.11E+05	3.09E+05	4.75E+05	1.71E+03	6.89E+05	6.35E+05	2.91E+05	1.65E+05	1.81E+05	1.91E+05	3.22E+05
2527.2	49.0	11	1.93E+05	2.45E+05	1.75E+05	1.74E+04	4.52E+05	2.82E+05	3.60E+04	2.84E+05	2.01E+05	8.64E+04	2.90E+05
3251.5	59.0	16	2.74E+05	3.67E+05	6.18E+05	1.46E+05	4.43E+05	3.90E+05	2.68E+04	3.08E+05	2.41E+05	1.24E+05	4.18E+05
2146.0	39.8	2	2.96E+05	2.33E+05	2.87E+05	3.41E+05	3.52E+05	4.17E+05	1.51E+05	3.17E+05	2.45E+05	2.08E+05	2.58E+05
1836.9	38.0	21	3.94E+05	5.11E+05	5.69E+05	1.56E+05	5.96E+05	5.04E+05	2.68E+05	3.74E+05	2.64E+05	2.09E+05	5.35E+05
1340.6	35.1	20	1.28E+06	9.95E+05	1.57E+06	7.98E+05	2.41E+06	2.37E+06	8.85E+05	1.21E+06	7.51E+05	9.67E+05	1.70E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
7.05E+04	7.48E+04	1.09E+05	1.56E+05	1.32E+05	1.05E+05	1.02	1.22E+00	9.51E-01	1.30	1.35E+00	3.00E-01	6.06E+04	7.89E+04
1.23E+05	1.54E+05	2.04E+05	1.96E+05	1.89E+05	1.06E+05	0.99	8.49E-01	9.79E-01	1.30	9.61E-01	1.56E-01	9.32E+04	1.21E+05
2.97E+05	3.57E+05	3.50E+05	8.73E+05	6.75E+05	3.60E+05	1.01	9.33E-01	9.52E-01	1.30	9.12E-01	1.52E-01	2.63E+05	3.42E+05
8.20E+05	8.39E+05	7.59E+05	1.43E+06	9.93E+05	9.42E+05	0.99	8.71E-01	9.69E-01	1.30	8.82E-01	1.28E-01	5.41E+05	7.02E+05
1.42E+05	2.35E+05	1.47E+05	5.58E+05	4.02E+05	2.35E+05	1.04	1.20E+00	8.90E-01	1.30	1.30E+00	3.13E-01	1.42E+05	1.85E+05
4.65E+05	5.70E+05	3.75E+05	7.55E+05	5.46E+05	5.66E+05	0.99	6.52E-01	9.63E-01	1.29	6.29E-01	4.16E-02	3.08E+05	3.99E+05
1.12E+05	1.11E+05	1.42E+05	1.24E+05	1.58E+05	3.40E+05	0.96	1.22E+00	9.07E-01	1.29	1.31E+00	3.06E-01	9.22E+04	1.19E+05
3.42E+05	2.39E+05	5.12E+05	6.99E+05	3.82E+05	9.26E+04	0.94	1.21E+00	8.43E-01	1.29	1.46E+00	3.59E-01	2.36E+05	3.05E+05
6.67E+04	8.18E+04	9.37E+04	2.32E+05	2.09E+05	5.66E+04	0.99	1.29E+00	9.84E-01	1.29	1.43E+00	3.57E-01	7.12E+04	9.16E+04
5.33E+05	4.51E+05	4.48E+05	7.63E+05	5.35E+05	3.81E+05	0.98	7.49E-01	9.32E-01	1.29	8.44E-01	1.26E-01	2.94E+05	3.78E+05
8.08E+06	1.03E+07	1.13E+07	2.33E+07	1.91E+07	1.75E+07	1.02	1.08E+00	9.48E-01	1.29	1.14E+00	2.50E-01	8.02E+06	1.03E+07
1.87E+05	2.76E+05	3.57E+05	2.89E+05	3.60E+05	2.29E+05	0.97	1.10E+00	9.29E-01	1.27	1.29E+00	3.27E-01	1.78E+05	2.26E+05
6.25E+05	5.76E+05	4.91E+05	1.11E+06	5.82E+05	7.63E+05	0.97	7.46E-01	8.64E-01	1.27	7.15E-01	1.05E-01	3.94E+05	4.99E+05
1.02E+05	1.70E+05	1.16E+05	3.53E+05	3.02E+05	2.34E+05	0.99	1.20E+00	9.70E-01	1.26	1.24E+00	3.40E-01	1.09E+05	1.38E+05
9.63E+04	9.60E+04	8.85E+04	8.56E+04	7.52E+04	1.14E+05	0.95	8.10E-01	8.37E-01	1.26	9.54E-01	2.24E-01	5.64E+04	7.10E+04
3.28E+05	3.47E+05	2.71E+05	7.02E+05	5.41E+05	4.96E+05	0.98	1.03E+00	9.51E-01	1.26	1.08E+00	2.87E-01	2.57E+05	3.23E+05
3.46E+05	2.35E+05	3.06E+05	5.46E+05	2.68E+05	5.27E+05	1.03	7.72E-01	8.86E-01	1.25	1.05E+00	2.79E-01	2.07E+05	2.59E+05
6.27E+06	6.97E+06	6.55E+06	1.17E+07	9.45E+06	9.01E+06	0.99	8.17E-01	9.46E-01	1.25	8.72E-01	1.97E-01	4.79E+06	5.99E+06
3.24E+04	6.25E+04	6.55E+04	1.10E+05	1.13E+05	8.47E+04	0.98	1.27E+00	9.47E-01	1.25	1.39E+00	4.13E-01	4.51E+04	5.64E+04
2.87E+06	2.64E+06	2.70E+06	3.84E+06	2.37E+06	4.19E+06	1.01	5.77E-01	9.63E-01	1.25	7.55E-01	1.46E-01	1.76E+06	2.19E+06
3.78E+05	2.69E+05	3.23E+05	4.03E+05	2.72E+05	3.31E+05	0.92	8.01E-01	7.23E-01	1.25	9.26E-01	2.36E-01	1.88E+05	2.35E+05
1.16E+05	2.15E+05	1.08E+05	3.81E+05	2.64E+05	2.87E+05	1.04	1.16E+00	8.78E-01	1.25	1.24E+00	3.67E-01	1.26E+05	1.57E+05
2.09E+05	2.62E+05	2.76E+05	4.54E+05	4.38E+05	3.35E+05	1.01	9.30E-01	9.79E-01	1.25	9.69E-01	2.54E-01	1.84E+05	2.29E+05
2.37E+05	2.98E+05	2.44E+05	5.34E+05	3.40E+05	1.95E+05	0.99	6.34E-01	9.31E-01	1.25	7.49E-01	1.65E-01	1.73E+05	2.16E+05
2.52E+05	3.37E+05	3.46E+05	5.96E+05	4.97E+05	4.27E+05	0.99	7.15E-01	9.56E-01	1.24	7.07E-01	1.28E-01	2.35E+05	2.93E+05
9.93E+05	1.16E+06	1.09E+06	1.76E+06	1.30E+06	1.32E+06	0.94	6.59E-01	7.46E-01	1.24	6.10E-01	8.49E-02	7.70E+05	9.58E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568908552	Carboxypeptidase PM20D1	2	GAIQIPTVSFSHEESNTTALAEFGYIR	Deamidated(16)	5.04	3	1023.5
19527130	EMILIN-1	7	LGALNNSLLLLLEDR	Deamidated(5)	2.79	2	770.9
7242138	Sodium/potassium-transporting ATPase subunit	3	DEDAENLGHFVMFPANGSIDLMYFPYYGK	Deamidated(16)Oxidation(12)Oxidation(22)	4.36	3	1125.2
568995055	Transferrin receptor protein 1	2	NITAFNETLFR	Deamidated(6)	2.84	2	663.8
254910995	alpha-N-	1	LLLTAAPNLTTSPAFR	Deamidated(8)	3.14	2	844.0
150378501	Carboxypeptidase D	4	GILNATLSVAEINHPVTTYK	Deamidated(4)	5.35	3	714.7
71040107	Cell adhesion molecule 1	1	VSLTNVSISDEGR	Deamidated(5)	3.97	2	689.3
111378397	phosphatidylinositol-glycan-specific phospholipase D	3	LSSSPNVTISCK	Carbamidomethyl(11)Deamidated(6)	3.49	2	647.3
114326497	Laminin subunit beta-1	6	LTDTASQSNSTAGELGALQAEAESLDK	Deamidated(9)	8.56	3	903.4
568962784	Laminin subunit beta-2	4	DGLALNLTLR	Deamidated(6)	3.1	2	543.8
6754354	Inhibin beta C chain	1	FMFFVQFPHNATQTMNIR	Deamidated(16)Oxidation(2)Oxidation(15)	3.64	3	754.7
755556472	Bis(5'-adenosyl)-triphosphatase enpp4	2	SNYSVIDLTPVAAILPK	Deamidated(2)	4.44	2	901.5
575771903	Inter alpha-trypsin inhibitor, heavy chain 4	5	KAFITNFSMIDGVTYPGVVK	Deamidated(6)Oxidation(9)	5.14	3	773.1
225903442	Integrin alpha-5	6	NALNLTFHAQNLGEGGAYEELR	Deamidated(1)Deamidated(4)	6.83	3	830.4
160358825	Beta-2-glycoprotein 1	3	NISFACNPGFFLNGTSSSK	Carbamidomethyl(6)Deamidated(1)Deamidated(13)	3.94	2	1025.5
84370361	Nidogen-2	1	TNIEGQVPFIPANFTAHTPYK	Deamidated(13)	5.65	3	820.4
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	DDLDPERNESEPGSQR	Deamidated(8)	3.74	3	615.6
111378397	phosphatidylinositol-glycan-specific phospholipase D	3	LTSFMLENGTSDCNLPENPLFISCDGR	Carbamidomethyl(13)Carbamidomethyl(24)Deamidated(8)Oxidation(5)	4.01	3	1035.5
755553838	Type 2 lactosamine alpha-2,3-sialyltransferase	1	LFYPESVFSDSSHYDPNTTAVLVVFKPQDLR	Deamidated(17)	4.88	4	893.9
31982712	Carboxypeptidase B2	3	AYISMHSYSQQILFPYSYNR	Deamidated(19)Oxidation(5)	5.55	3	829.1
755541228	Synaptophysin-like protein	2	NQTVTATFGYPFR	Deamidated(1)	3.74	2	751.9
12963613	Junctional adhesion molecule C	1	FQNSSFHVNSETGTLVFNAVHK	Deamidated(3)	4.96	4	616.8
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	ALVNFTR	Deamidated(4):Carbamyl	2.49	2	432.7
113195678	Lysosomal-associated membrane protein 1	7	ENVSDPSLTITFGR	Deamidated(2)	3.26	2	768.9
755542383	Serine protease inhibitor A3N	1	YTGNASAMFILPDQ GK	Deamidated(4)Oxidation(8)	3.93	2	865.4
568986620	Clusterin	3	RNSTGCLK	Carbamidomethyl(6)Deamidated(2)	2.68	2	468.7

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
3068.5	58.1	8	5.98E+04	4.33E+04	1.81E+05	4.60E+04	1.88E+05	1.53E+05	6.86E+03	9.25E+04	5.92E+04	2.92E+04	1.71E+05
1540.9	55.2	193	1.35E+05	2.11E+05	2.78E+05	1.50E+05	4.53E+05	3.39E+05	6.07E+04	2.21E+05	1.02E+05	1.54E+05	3.09E+05
3373.5	63.9	13	5.74E+04	8.11E+04	1.49E+05	3.78E+04	1.53E+05	1.50E+05	8.61E+03	8.40E+04	5.45E+04	3.62E+04	1.13E+05
1326.7	50.2	5	1.96E+05	1.15E+05	3.58E+05	1.05E+05	5.23E+05	4.99E+05	1.19E+05	3.23E+05	1.49E+05	1.76E+05	3.07E+05
1686.9	52.2	18	2.04E+05	2.19E+05	2.84E+05	7.09E+04	3.20E+05	3.22E+05	9.43E+04	1.72E+05	1.09E+05	1.43E+05	1.66E+05
2142.1	50.1	12	1.26E+05	1.26E+05	1.94E+05	7.03E+04	1.88E+05	1.57E+05	5.13E+04	1.09E+05	6.71E+04	6.39E+04	1.73E+05
1377.7	38.0	16	9.23E+04	1.20E+05	1.33E+05	4.04E+04	1.79E+05	1.49E+05	8.25E+04	9.87E+04	5.33E+04	7.24E+04	8.79E+04
1293.6	28.3	14	2.04E+05	2.26E+05	3.37E+05	8.83E+04	4.82E+05	4.35E+05	2.91E+05	1.51E+05	2.31E+05	1.18E+05	3.10E+05
2708.3	52.4	88	1.61E+05	1.43E+05	2.93E+05	1.07E+05	3.51E+05	3.00E+05	1.02E+05	1.42E+05	1.04E+05	1.51E+05	2.17E+05
1086.6	52.9	70	1.32E+06	1.88E+06	3.34E+06	1.36E+06	3.99E+06	4.19E+06	7.36E+05	2.57E+06	7.98E+05	5.46E+05	3.42E+06
2262.0	48.7	1	2.24E+05	3.19E+05	3.13E+05	1.93E+05	3.16E+05	2.57E+05	1.44E+05	1.89E+05	1.38E+05	1.25E+05	2.78E+05
1802.0	66.2	20	1.65E+05	2.03E+05	4.24E+05	1.06E+05	3.58E+05	3.67E+05	7.54E+04	2.16E+05	1.49E+05	1.21E+05	3.53E+05
2317.2	58.4	75	1.79E+06	4.13E+06	7.11E+06	2.07E+06	7.43E+06	6.78E+06	1.31E+06	2.59E+06	4.26E+06	2.09E+06	2.88E+06
2489.2	46.6	29	3.20E+04	9.81E+04	1.07E+05	4.16E+03	7.07E+04	9.07E+04	1.95E+04	5.98E+04	3.18E+04	1.52E+04	9.33E+04
2049.9	58.2	15	1.31E+05	2.08E+05	3.00E+05	5.13E+04	4.53E+05	3.84E+05	9.56E+04	1.34E+05	9.69E+04	9.79E+04	2.60E+05
2459.3	53.7	38	1.78E+06	2.12E+06	4.44E+06	1.49E+06	5.54E+06	5.25E+06	9.02E+05	2.80E+06	1.49E+06	1.53E+06	3.59E+06
1844.8	22.8	16	4.41E+05	2.54E+05	5.12E+05	0.00E+00	9.48E+05	9.02E+05	3.12E+05	6.34E+05	2.45E+05	2.52E+05	7.11E+05
3104.4	58.2	9	6.06E+04	8.06E+04	1.51E+05	2.21E+04	1.86E+05	1.60E+05	4.40E+04	4.66E+04	8.67E+04	2.45E+04	1.21E+05
3572.8	59.3	4	5.79E+04	9.95E+04	1.60E+05	5.62E+04	1.42E+05	1.48E+05	2.79E+03	1.38E+05	6.22E+04	2.17E+04	1.18E+05
2485.2	44.1	15	2.00E+05	3.43E+05	3.38E+05	5.46E+05	2.25E+05	2.24E+05	6.87E+04	2.25E+05	2.14E+05	2.11E+05	2.40E+05
1502.7	49.8	17	6.97E+05	8.19E+05	1.12E+06	4.06E+05	1.34E+06	1.25E+06	5.47E+05	9.87E+05	6.45E+05	4.37E+05	1.21E+06
2464.2	40.7	13	2.18E+05	1.86E+05	3.81E+05	1.45E+05	4.34E+05	3.71E+05	1.24E+05	2.70E+05	1.49E+05	1.47E+05	3.13E+05
864.5	51.3	8	4.48E+05	3.69E+05	2.11E+05	3.26E+05	9.33E+05	7.92E+05	2.24E+05	4.15E+05	3.03E+05	4.38E+05	3.93E+05
1536.7	46.5	8	5.38E+05	7.44E+05	6.80E+05	3.17E+05	8.52E+05	9.03E+05	4.30E+05	5.75E+05	2.79E+05	2.04E+05	7.29E+05
1729.8	41.5	39	7.98E+05	2.05E+06	1.82E+06	1.10E+06	2.49E+06	2.17E+06	1.42E+06	9.70E+05	3.50E+06	1.32E+06	1.94E+06
936.5	15.9	1	1.22E+06	1.82E+06	2.68E+06	0.00E+00	4.92E+06	9.99E+01	1.76E+06	5.22E+05	1.98E+05	5.78E+05	1.54E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
5.72E+04	6.15E+04	7.45E+04	1.17E+05	1.27E+05	7.66E+04	0.97	1.19E+00	9.16E-01	1.24	1.30E+00	4.00E-01	5.21E+04	6.48E+04
1.89E+05	1.81E+05	1.63E+05	1.95E+05	1.86E+05	2.33E+05	0.93	7.60E-01	7.40E-01	1.24	8.21E-01	1.91E-01	1.22E+05	1.51E+05
6.47E+04	7.12E+04	7.62E+04	1.28E+05	1.03E+05	7.34E+04	0.97	9.41E-01	8.88E-01	1.24	9.82E-01	2.71E-01	4.93E+04	6.12E+04
1.77E+05	1.99E+05	2.44E+05	3.49E+05	3.35E+05	2.30E+05	0.95	8.60E-01	8.36E-01	1.24	8.74E-01	2.37E-01	1.50E+05	1.87E+05
1.67E+05	1.61E+05	1.51E+05	3.20E+05	1.84E+05	2.26E+05	0.95	7.51E-01	8.03E-01	1.24	7.49E-01	1.56E-01	1.14E+05	1.41E+05
8.39E+04	9.99E+04	9.32E+04	1.45E+05	1.68E+05	1.08E+05	0.97	7.49E-01	8.56E-01	1.24	7.27E-01	1.47E-01	6.93E+04	8.58E+04
5.58E+04	1.21E+05	7.69E+04	1.27E+05	1.45E+05	1.25E+05	0.96	7.11E-01	8.28E-01	1.24	6.69E-01	1.17E-01	6.01E+04	7.45E+04
1.90E+05	1.54E+05	2.95E+05	3.71E+05	2.77E+05	4.03E+05	0.97	8.37E-01	9.04E-01	1.24	8.44E-01	2.11E-01	1.56E+05	1.93E+05
1.45E+05	1.41E+05	1.52E+05	2.16E+05	1.64E+05	2.16E+05	0.93	6.60E-01	6.98E-01	1.24	6.21E-01	1.09E-01	1.06E+05	1.31E+05
1.51E+06	1.52E+06	1.99E+06	3.21E+06	2.52E+06	2.39E+06	0.95	9.92E-01	8.55E-01	1.24	1.09E+00	3.30E-01	1.25E+06	1.55E+06
1.96E+05	2.03E+05	1.58E+05	3.38E+05	2.50E+05	2.51E+05	0.97	5.96E-01	8.27E-01	1.24	5.85E-01	8.30E-02	1.34E+05	1.66E+05
1.84E+05	1.73E+05	1.85E+05	2.74E+05	2.53E+05	2.14E+05	0.96	8.35E-01	8.50E-01	1.24	8.79E-01	2.31E-01	1.31E+05	1.62E+05
5.01E+06	2.38E+06	3.62E+06	7.73E+06	4.47E+06	4.18E+06	0.97	9.98E-01	9.07E-01	1.23	1.16E+00	3.67E-01	2.43E+06	3.00E+06
4.79E+04	4.26E+04	3.79E+04	8.45E+04	6.15E+04	6.91E+04	0.99	1.09E+00	9.72E-01	1.23	1.22E+00	3.95E-01	3.33E+04	4.10E+04
1.95E+05	1.50E+05	1.30E+05	2.69E+05	2.02E+05	2.00E+05	0.91	9.18E-01	7.37E-01	1.22	9.67E-01	3.05E-01	1.14E+05	1.39E+05
2.07E+06	2.28E+06	2.16E+06	3.99E+06	3.05E+06	2.62E+06	0.93	8.57E-01	7.57E-01	1.22	8.59E-01	2.66E-01	1.61E+06	1.96E+06
2.26E+05	3.39E+05	5.29E+05	6.06E+05	4.90E+05	4.03E+05	0.94	9.88E-01	8.24E-01	1.21	1.10E+00	3.84E-01	2.70E+05	3.28E+05
6.60E+04	5.11E+04	9.48E+04	9.61E+04	9.81E+04	1.65E+05	0.96	1.07E+00	8.89E-01	1.21	1.13E+00	4.05E-01	5.34E+04	6.47E+04
5.07E+04	9.22E+04	8.93E+04	1.17E+05	1.57E+05	1.18E+05	0.99	1.00E+00	9.67E-01	1.21	1.09E+00	3.91E-01	5.66E+04	6.86E+04
2.87E+05	2.13E+05	1.71E+05	2.71E+05	2.96E+05	3.09E+05	0.94	6.56E-01	7.58E-01	1.20	7.73E-01	2.62E-01	1.56E+05	1.88E+05
5.53E+05	7.50E+05	7.99E+05	1.13E+06	1.12E+06	6.43E+05	0.96	6.92E-01	8.02E-01	1.20	7.41E-01	2.34E-01	5.08E+05	6.11E+05
1.80E+05	1.86E+05	2.12E+05	2.87E+05	2.82E+05	2.78E+05	0.93	6.71E-01	6.98E-01	1.20	6.24E-01	1.73E-01	1.45E+05	1.74E+05
3.91E+05	3.20E+05	3.34E+05	6.02E+05	4.32E+05	3.14E+05	0.90	7.16E-01	6.37E-01	1.20	8.13E-01	2.82E-01	2.55E+05	3.06E+05
3.55E+05	5.32E+05	4.80E+05	7.53E+05	5.63E+05	8.43E+05	0.94	7.19E-01	7.55E-01	1.20	7.18E-01	2.35E-01	3.38E+05	4.05E+05
2.61E+06	9.36E+05	1.38E+06	2.02E+06	1.25E+06	3.29E+06	1.02	9.18E-01	9.42E-01	1.20	1.45E+00	5.42E-01	1.15E+06	1.38E+06
1.42E+06	1.57E+06	2.97E+05	9.25E+05	1.21E+06	2.48E+06	0.86	1.40E+00	7.30E-01	1.20	1.72E+00	6.08E-01	7.69E+05	9.22E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
755532856	Laminin, alpha 2	17	CNINGSFSEICHTR	Carbamidomethyl(1)Carbamidomethyl(11)Deamidated(2)Deamidated(4)	3.9	3	566.2
568958751	Hypoxia up-regulated protein 1	7	LGNTISSLFGGGTSSDAKENGTDV QEEEESPAEGSK	Deamidated(20)	5.89	3	1233.9
568953122	Insulin receptor	4	GLSPGNYSVR	Deamidated(6)	2.63	2	525.8
22203747	Collagen alpha-2(VI) chain	6	HAELSFVFLTDGVTGNDLSLEESVHS MR	Deamidated(16)Oxidation(26)	3.36	3	998.5
568920137	Laminin subunit alpha-5	15	QLLANSSALEETILGHQGR	Deamidated(5)	6.41	3	680.0
568922760	Immunoglobulin superfamily member 10	6	YTLFHNGTLYFNK	Deamidated(6)	4.74	3	540.3
109627652	Complement factor H	2	DNSCVDPPHPNATIVTR	Carbamidomethyl(4)Deamidated(12)	4.09	3	665.0
755532856	Laminin, alpha 2	17	LSAITNDTAAK	Deamidated(6)	3.02	2	553.3
148747546	Serine protease inhibitor A3K	4	EMDIVFHEHQDNGTQDDSLTLASV NTDFAFSLYK	Deamidated(12)Oxidation(2)	6.59	4	976.9
569003157	Desmocollin-2	2	NGIYNITVLALDADGR	Deamidated(1)Deamidated(5)	3.09	2	853.9
150378501	Carboxypeptidase D	4	GLVMNYPHITNLTTLGQSVEYR	Deamidated(11)Oxidation(4)	6.46	3	841.8
116014342	Basigin	4	TSDTGEEEEAITNSTEANGKYVVVST PEK	Deamidated(12)Deamidated(17)	5.37	3	986.8
568956041	Cadherin-13	6	QENISVGSVLLTVNATDPDSLQHQ TIR	Deamidated(3)Deamidated(14)	5.18	3	979.8
568991301	Plexin B2	10	TEAGVFEYVADPTFENFTGGVK	Deamidated(16)	5.59	3	793.7
569003077	Cadherin-2	6	SNISILR	Deamidated(2)	2.59	2	402.2
171846253	Transmembrane glycoprotein NMB	6	NDRNLSDEIFLR	Deamidated(1)Deamidated(4)	3.77	3	498.3
568962784	Laminin subunit beta-2	4	RANASTFAVPSVNSADTR	Deamidated(3)	5.42	3	683.7
148747408	Laminin subunit alpha-4	7	LSNLSNLSHDLVQEATDHAYNLQ QEADLSR	Deamidated(3)	7.74	4	878.7
6679653	Glutamyl aminopeptidase	1	IALNLTMYLK	Deamidated(4)Oxidation(7)	2.89	2	598.8
161702988	Apolipoprotein B-100	2	LTYESGFLNYSK	Deamidated(9)	3.21	2	711.8
310616735	H-2 class I histocompatibility antigen, Q7 alpha chain	1	EQNYTCHVNHEGLPEPLTLR	Carbamidomethyl(6)Deamidated(3)	3.35	4	602.8
6680856	Corticosteroid-binding globulin	2	VPMMVQSGNISYFR	Deamidated(9)Oxidation(3)Oxidation(4)	3.6	2	831.4
23346525	CD109 antigen	3	QLNGSVIAK	Deamidated(3)	2.61	2	465.8
6755987	Vitronectin	3	FEDGVLDPGYPRNISEGFSGIPDNV DAAFALPAHR	Deamidated(13)	5.43	4	937.0
755532856	Laminin, alpha 2	17	QANISIVDIDSNQEENVATSSSGN NFGLDLK	Deamidated(3)	8.11	3	1094.2
6681143	Decorin	3	ISDTNITAIPQGLPTSLTEVHLDG NKITK	Deamidated(5)Deamidated(25)	4.63	4	770.4
569003157	Desmocollin-2	2	EAETVRNGIYNITVLALDADGR	Deamidated(7)Deamidated(11)	5.25	3	798.1

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1696.7	33.9	6	3.84E+04	3.62E+04	1.06E+05	1.76E+04	1.28E+05	1.22E+05	3.47E+04	3.22E+04	3.05E+04	3.32E+04	8.86E+04
3699.7	43.4	3	1.22E+05	1.15E+05	9.66E+04	5.96E+04	1.48E+05	1.00E+05	8.70E+04	9.64E+04	5.27E+04	5.11E+04	1.40E+05
1050.5	28.4	7	2.01E+05	1.17E+05	2.62E+05	9.40E+04	3.74E+05	3.60E+05	1.56E+05	1.89E+05	2.00E+05	1.36E+05	2.40E+05
2993.4	49.7	256	6.99E+06	7.24E+06	1.66E+07	5.66E+06	1.96E+07	2.04E+07	1.58E+06	1.39E+07	3.80E+06	2.10E+06	1.41E+07
2038.1	48.9	61	1.15E+06	1.17E+06	2.60E+06	1.27E+06	3.18E+06	2.91E+06	6.11E+05	1.64E+06	9.01E+05	1.07E+06	2.23E+06
1618.8	42.6	4	8.86E+04	1.06E+05	1.62E+05	8.56E+04	2.70E+05	2.26E+05	4.88E+04	1.19E+05	5.85E+04	8.25E+04	1.59E+05
1992.9	36.3	12	3.76E+05	5.90E+05	8.65E+05	2.25E+05	1.29E+06	1.23E+06	4.86E+05	2.45E+05	5.75E+05	3.88E+05	6.91E+05
1105.6	25.4	68	4.47E+06	4.48E+06	7.05E+06	1.83E+03	1.09E+07	8.62E+06	6.12E+06	4.44E+06	3.16E+06	2.65E+06	6.45E+06
3904.8	56.6	4	1.17E+05	3.31E+05	2.78E+05	1.78E+05	1.97E+05	1.86E+05	5.96E+03	7.45E+04	1.04E+05	5.11E+04	1.32E+05
1706.9	66.0	81	1.69E+05	1.72E+05	5.49E+05	1.19E+05	6.73E+05	6.09E+05	3.60E+04	3.03E+05	1.87E+05	1.57E+05	4.29E+05
2523.3	49.6	14	1.94E+05	3.10E+05	2.34E+05	9.14E+04	2.11E+05	3.75E+05	8.41E+04	2.06E+05	1.25E+05	9.96E+04	2.35E+05
2958.4	36.1	13	4.59E+05	1.90E+05	6.13E+05	1.87E+05	1.11E+06	1.14E+06	1.83E+05	3.70E+05	3.24E+05	3.99E+05	3.49E+05
2937.5	54.0	25	4.97E+05	3.42E+05	9.61E+05	2.85E+05	1.35E+06	1.47E+06	1.78E+05	9.58E+05	4.35E+05	3.76E+05	1.20E+06
2379.1	60.5	37	4.04E+05	7.34E+05	7.90E+05	2.09E+05	6.79E+05	6.74E+05	1.15E+05	4.68E+05	2.10E+05	2.00E+05	5.39E+05
803.5	33.8	16	9.97E+05	5.37E+05	1.77E+06	5.16E+05	2.60E+06	2.88E+06	8.78E+05	1.25E+06	8.39E+05	1.03E+06	1.79E+06
1492.7	37.2	117	1.02E+06	1.03E+06	1.38E+06	2.70E+05	1.09E+06	1.04E+06	8.14E+05	7.45E+05	2.43E+05	3.87E+05	6.62E+05
2049.0	34.0	74	3.15E+06	2.64E+06	4.16E+06	1.94E+06	6.23E+06	6.22E+06	2.31E+06	2.68E+06	1.88E+06	2.69E+06	3.27E+06
3511.7	58.2	78	1.82E+06	2.25E+06	3.76E+06	1.66E+06	5.64E+06	4.67E+06	1.45E+05	2.32E+06	1.49E+06	8.71E+05	2.23E+06
1196.7	54.0	21	3.16E+05	3.13E+05	6.07E+05	2.47E+05	5.46E+05	6.15E+05	1.09E+05	4.32E+05	1.87E+05	1.10E+05	6.35E+05
1422.7	42.4	13	8.57E+04	1.73E+05	2.04E+05	1.05E+05	1.98E+05	1.73E+05	1.23E+05	1.16E+05	1.94E+05	7.26E+04	1.43E+05
2408.1	35.2	1	1.25E+05	6.99E+04	9.92E+04	5.50E+04	1.59E+05	1.46E+05	6.20E+04	7.62E+04	7.01E+04	5.46E+04	1.40E+05
1661.8	36.5	1	1.27E+05	7.76E+04	1.83E+05	1.41E+05	1.98E+05	3.23E+05	1.15E+05	1.38E+05	9.39E+04	8.49E+04	1.43E+05
930.5	26.8	10	4.34E+05	3.26E+05	3.44E+05	3.94E+04	4.37E+05	3.63E+05	4.65E+05	4.00E+05	2.94E+05	2.25E+05	3.81E+05
3744.8	57.4	5	1.24E+05	6.91E+04	1.14E+05	1.57E+05	6.24E+05	5.03E+05	1.48E+04	1.18E+05	1.53E+05	8.89E+04	5.73E+04
3280.5	54.9	129	1.08E+06	1.19E+06	2.04E+06	8.28E+05	2.62E+06	2.38E+06	2.59E+05	1.29E+06	7.83E+05	5.37E+05	2.07E+06
3078.6	51.4	1	1.81E+05	5.67E+05	3.68E+05	1.17E+05	5.22E+05	3.63E+05	1.46E+05	2.59E+05	9.75E+04	1.11E+05	2.73E+05
2392.2	57.4	17	1.85E+05	1.40E+05	3.18E+05	1.33E+05	5.46E+05	6.62E+05	7.23E+04	2.41E+05	1.67E+05	1.40E+05	3.69E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
4.08E+04	5.98E+04	4.24E+04	5.81E+04	4.24E+04	5.93E+04	0.88	9.29E-01	6.49E-01	1.20	1.04E+00	4.04E-01	3.31E+04	3.96E+04
4.58E+04	4.53E+04	8.33E+04	1.51E+05	9.81E+04	1.31E+05	0.96	7.39E-01	8.16E-01	1.20	7.52E-01	3.01E-01	5.64E+04	6.74E+04
1.37E+05	1.58E+05	2.34E+05	3.04E+05	2.50E+05	1.72E+05	0.94	7.10E-01	7.45E-01	1.20	7.61E-01	2.60E-01	1.26E+05	1.51E+05
4.49E+06	6.17E+06	8.26E+06	1.61E+07	1.45E+07	1.49E+07	0.95	1.14E+00	8.53E-01	1.19	1.24E+00	4.88E-01	5.97E+06	7.13E+06
1.19E+06	1.45E+06	1.35E+06	2.17E+06	1.50E+06	1.35E+06	0.90	7.43E-01	6.26E-01	1.19	7.68E-01	2.72E-01	9.63E+05	1.15E+06
9.12E+04	1.22E+05	8.07E+04	1.30E+05	1.29E+05	1.30E+05	0.89	7.38E-01	6.21E-01	1.19	7.24E-01	2.58E-01	7.20E+04	8.59E+04
4.99E+05	4.86E+05	4.89E+05	6.73E+05	4.94E+05	1.08E+06	0.92	8.89E-01	7.31E-01	1.19	9.13E-01	3.56E-01	3.71E+05	4.43E+05
3.89E+06	5.02E+06	4.63E+06	6.96E+06	4.93E+06	5.31E+06	0.91	7.76E-01	6.78E-01	1.19	7.67E-01	2.78E-01	3.10E+06	3.69E+06
1.60E+05	1.69E+05	8.39E+04	1.99E+05	1.69E+05	2.64E+05	0.94	9.84E-01	8.09E-01	1.19	1.15E+00	4.61E-01	9.41E+04	1.12E+05
2.29E+05	1.88E+05	2.66E+05	3.99E+05	3.60E+05	2.35E+05	0.90	1.00E+00	7.34E-01	1.19	1.07E+00	4.43E-01	1.76E+05	2.09E+05
1.70E+05	1.36E+05	2.19E+05	2.83E+05	2.57E+05	1.27E+05	0.94	7.75E-01	7.57E-01	1.19	8.77E-01	3.46E-01	1.19E+05	1.42E+05
4.18E+05	2.61E+05	4.62E+05	7.13E+05	7.07E+05	2.76E+05	0.88	9.99E-01	6.77E-01	1.19	1.09E+00	4.53E-01	2.82E+05	3.35E+05
5.78E+05	5.03E+05	6.22E+05	7.31E+05	6.89E+05	5.42E+05	0.91	9.49E-01	7.29E-01	1.19	1.09E+00	4.55E-01	4.12E+05	4.89E+05
3.03E+05	4.26E+05	3.70E+05	6.17E+05	5.75E+05	5.11E+05	0.93	8.03E-01	7.42E-01	1.18	8.38E-01	3.41E-01	2.73E+05	3.23E+05
8.96E+05	9.98E+05	1.36E+06	1.37E+06	1.36E+06	8.33E+05	0.88	8.00E-01	6.22E-01	1.18	8.97E-01	3.71E-01	7.66E+05	9.07E+05
5.96E+05	7.57E+05	5.89E+05	1.44E+06	9.65E+05	7.90E+05	0.91	7.83E-01	6.64E-01	1.18	8.30E-01	3.34E-01	4.78E+05	5.66E+05
2.68E+06	2.76E+06	2.56E+06	4.87E+06	3.20E+06	2.48E+06	0.88	6.61E-01	5.35E-01	1.18	6.56E-01	2.27E-01	1.95E+06	2.30E+06
1.61E+06	2.36E+06	1.90E+06	4.34E+06	3.29E+06	2.74E+06	0.92	1.00E+00	7.51E-01	1.18	1.01E+00	4.25E-01	1.48E+06	1.75E+06
2.12E+05	2.64E+05	2.77E+05	4.56E+05	4.58E+05	3.87E+05	0.93	9.07E-01	7.76E-01	1.18	9.80E-01	4.24E-01	2.14E+05	2.53E+05
1.68E+05	8.97E+04	1.70E+05	2.21E+05	1.35E+05	1.76E+05	0.96	6.01E-01	8.14E-01	1.18	9.13E-01	3.83E-01	9.27E+04	1.09E+05
5.31E+04	9.26E+04	8.16E+04	1.04E+05	6.83E+04	1.06E+05	0.91	6.75E-01	6.23E-01	1.18	7.03E-01	2.74E-01	5.51E+04	6.50E+04
5.61E+04	1.30E+05	1.38E+05	1.74E+05	1.73E+05	2.46E+05	0.92	8.11E-01	7.11E-01	1.18	7.78E-01	3.16E-01	8.80E+04	1.04E+05
2.96E+05	3.32E+05	3.31E+05	3.19E+05	2.48E+05	4.63E+05	0.94	5.66E-01	6.92E-01	1.18	7.03E-01	2.76E-01	2.07E+05	2.44E+05
1.34E+05	6.99E+04	1.25E+05	6.75E+05	2.90E+05	6.07E+04	0.90	1.91E+00	8.40E-01	1.18	2.16E+00	7.31E-01	1.14E+05	1.34E+05
1.07E+06	1.12E+06	8.97E+05	1.81E+06	1.29E+06	1.21E+06	0.90	8.70E-01	6.76E-01	1.18	9.19E-01	4.03E-01	7.84E+05	9.21E+05
1.84E+05	2.20E+05	2.27E+05	5.17E+05	3.32E+05	2.70E+05	0.92	9.61E-01	7.39E-01	1.17	1.07E+00	4.73E-01	1.65E+05	1.94E+05
2.21E+05	1.65E+05	2.61E+05	3.25E+05	2.74E+05	1.76E+05	0.88	9.44E-01	6.66E-01	1.17	1.04E+00	4.68E-01	1.53E+05	1.80E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
268370173	Peroxidasin homolog	4	VYCNLSAAYTFEDLK	Carbamidomethyl(3)Deamidated(4)	3.51	2	897.9
114326497	Laminin subunit beta-1	6	MEMPSTPQQLQNLTEDIR	Deamidated(12)Oxidation(1)Oxidation(3)	3.28	3	721.7
755537649	Platelet endothelial cell adhesion molecule	8	LDQGELLDLSCSVSGTPVANFTIQK	Carbamidomethyl(11)Deamidated(20)	6.76	3	898.5
31560090	Putative phospholipase B-like 2	1	SDLNPANGSYPFQALHQR	Deamidated(7)	3.37	3	672.7
50355939	Anthrax toxin receptor 2	1	AVTSISHDGSVLCTFTANSTYTK	Carbamidomethyl(13)Deamidated(18)	6.42	3	821.1
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	DAVNNITAK	Deamidated(5)	2.51	2	473.7
164565411	Collagen alpha-1(V)	3	NVTLLDCK	Carbamidomethyl(8)Deamidated(1)	2.49	2	538.8
110347469	Alpha-2-macroglobulin	5	INVSYTGERPSSNMVIVDVK	Deamidated(2)Oxidation(14)	4.86	3	742.4
171846253	Transmembrane glycoprotein NMB	6	VSINTVNLTAGPQVMEVTVFRR	Deamidated(7)Oxidation(15)	3.69	3	816.8
31560378	Tetraspanin-6	1	EYNSTGDYR	Deamidated(3)	2.7	2	553.2
364502993	Voltage-dependent L-type calcium channel subunit alpha-1C	1	IALNDTTEINR	Deamidated(4)	2.58	2	630.8
113195678	Lysosomal-associated membrane protein 1	7	LNMTLPDALVPTFSISNHSK	Deamidated(17)Oxidation(3)	5.74	3	772.7
7304875	Alpha-2-HS-glycoprotein	2	RPFGVVYEMVDTLETTCHALDPTPLANCSVR	Carbamidomethyl(18)Carbamidomethyl(29)Deamidated(28)Oxidation(9)	7.05	4	924.4
61656186	Lman2l protein	1	VFPYISAMVNNGLSLYDHER	Deamidated(11)Oxidation(8)	5.52	3	772.7
755537649	Platelet endothelial cell adhesion molecule	8	VLFYKDDAMVYNVTSR	Deamidated(12)Oxidation(9)	4.37	3	646.6
755532856	Laminin, alpha 2	17	LEQMTMNINLTGPLPAPYK	Deamidated(7)Deamidated(9)Oxidation(4)Oxidation(6)	4.21	2	1082.5
7242138	Sodium/potassium-transporting ATPase subunit	3	FHVNYTQPLVAVK	Deamidated(4)	4.1	2	758.9
755532856	Laminin, alpha 2	17	NSGLLGALNDTMDK	Deamidated(1)Deamidated(9)Oxidation(12)	3.08	2	732.9
6753484	Collagen alpha-1(VI) chain	5	NITAQICIDK	Carbamidomethyl(7)Deamidated(1)	2.62	2	588.8
568950268	Protocadherin-16	1	ETTPALLLVEATDRPANASR	Deamidated(18)	3.34	3	747.1
156616286	Collagen alpha-6(VI) chain	11	VISLSTGNNKTEVLQR	Deamidated(10)	3.65	2	924.0
236465805	Plasma kallikrein	1	LQTPLNYTEFQKPICLPSK	Carbamidomethyl(15)Deamidated(6)	4.87	3	760.1
568939507	CAS1 domain-containing protein 1	1	MNITSIAPLLEK	Deamidated(2)Oxidation(1)	2.85	2	673.9

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1794.8	48.8	3	7.16E+04	1.03E+05	2.22E+05	1.29E+05	3.01E+05	1.49E+05	6.04E+04	1.01E+05	1.35E+05	1.09E+05	1.65E+05
2163.0	44.9	68	3.03E+06	3.16E+06	5.62E+06	2.17E+06	7.68E+06	7.23E+06	2.37E+06	3.33E+06	2.61E+06	2.21E+06	4.24E+06
2693.3	60.8	30	2.34E+05	2.88E+05	4.47E+05	1.39E+05	6.31E+05	5.48E+05	6.07E+04	3.91E+05	1.92E+05	8.46E+04	5.22E+05
2016.0	40.1	12	1.12E+05	7.22E+04	1.04E+05	3.92E+04	1.68E+05	1.61E+05	5.19E+04	7.90E+04	4.26E+04	5.04E+04	8.07E+04
2461.2	41.1	11	1.03E+05	1.04E+05	1.87E+05	6.50E+04	2.09E+05	1.94E+05	9.14E+04	1.28E+05	7.78E+04	6.92E+04	1.78E+05
946.5	25.2	2	2.51E+05	1.34E+05	2.85E+05	4.45E+03	5.22E+05	5.03E+05	1.51E+05	2.55E+05	1.23E+05	1.31E+05	3.38E+05
1076.6	43.7	1	8.30E+04	7.26E+04	1.63E+05	2.75E+04	2.69E+05	2.56E+05	6.00E+04	1.02E+05	4.85E+04	6.43E+04	1.61E+05
2225.1	36.4	24	8.87E+05	1.06E+06	1.46E+06	1.02E+06	1.64E+06	1.50E+06	3.56E+05	9.39E+05	8.99E+05	5.29E+05	1.17E+06
2448.3	46.3	2	3.87E+05	3.88E+05	5.59E+05	1.71E+05	5.58E+05	5.45E+05	1.17E+05	3.28E+05	1.20E+05	1.59E+05	2.34E+05
1105.4	19.5	2	1.85E+05	4.56E+04	3.87E+04	1.20E+03	2.26E+05	2.28E+05	1.66E+05	1.09E+05	5.37E+04	2.45E+03	1.37E+05
1260.6	32.9	5	7.07E+04	3.06E+04	1.21E+05	2.66E+04	2.14E+05	2.03E+05	3.00E+04	8.94E+04	5.97E+04	5.90E+04	1.35E+05
2316.2	54.2	168	2.91E+05	3.38E+05	6.04E+05	1.59E+05	7.17E+05	6.58E+05	1.75E+05	3.56E+05	2.00E+05	1.78E+05	4.71E+05
3694.7	50.7	55	1.64E+06	3.49E+06	4.07E+06	7.04E+05	4.82E+06	5.50E+06	4.91E+05	1.05E+06	1.46E+06	6.41E+05	3.31E+06
2316.1	43.1	17	2.09E+05	1.70E+05	2.64E+05	1.07E+05	3.82E+05	3.35E+05	4.40E+04	1.81E+05	9.68E+04	1.21E+05	1.85E+05
1937.9	39.0	19	5.08E+05	3.85E+05	6.48E+05	2.69E+05	9.81E+05	9.15E+05	2.45E+05	3.86E+05	2.87E+05	3.76E+05	4.12E+05
2164.1	46.1	95	2.99E+06	4.15E+06	6.92E+06	2.33E+06	8.09E+06	7.21E+06	3.60E+06	3.61E+06	2.81E+06	3.02E+06	5.11E+06
1516.8	39.9	26	2.52E+05	2.24E+05	4.23E+05	2.29E+05	5.62E+05	6.60E+05	1.84E+05	3.86E+05	1.95E+05	1.95E+05	3.61E+05
1464.7	41.0	68	7.55E+05	1.30E+06	2.29E+06	6.73E+05	2.57E+06	2.20E+06	1.36E+06	1.20E+06	8.23E+05	7.45E+05	1.77E+06
1176.6	38.4	10	5.57E+04	9.65E+04	1.98E+05	4.20E+04	2.60E+05	2.91E+05	4.55E+04	1.69E+05	5.45E+04	3.53E+04	2.13E+05
2239.2	56.6	13	5.80E+04	5.21E+04	9.88E+04	3.25E+04	2.05E+05	1.55E+05	2.56E+04	1.01E+05	3.66E+04	2.77E+04	1.14E+05
1847.0	29.8	30	3.71E+05	2.57E+05	4.51E+05	1.89E+05	7.24E+05	6.29E+05	2.21E+05	4.03E+05	2.52E+05	3.09E+05	3.81E+05
2278.2	47.2	7	6.01E+04	1.15E+05	2.06E+05	6.25E+04	2.85E+05	2.49E+05	4.64E+04	1.09E+05	1.26E+05	4.86E+04	2.42E+05
1346.7	49.7	18	2.41E+05	2.87E+05	4.41E+05	1.64E+05	4.64E+05	4.67E+05	1.76E+05	3.17E+05	2.10E+05	2.17E+05	3.17E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
7.24E+04	1.15E+05	1.10E+05	1.54E+05	1.60E+05	1.49E+05	0.92	7.27E-01	6.79E-01	1.17	7.31E-01	3.23E-01	8.15E+04	9.57E+04
2.83E+06	3.46E+06	3.48E+06	5.61E+06	4.01E+06	3.81E+06	0.90	7.07E-01	6.01E-01	1.17	6.62E-01	2.62E-01	2.34E+06	2.74E+06
2.14E+05	2.55E+05	2.78E+05	3.61E+05	3.92E+05	2.92E+05	0.92	9.40E-01	7.47E-01	1.17	1.02E+00	4.66E-01	1.87E+05	2.19E+05
7.17E+04	9.59E+04	7.06E+04	1.11E+05	8.25E+04	8.52E+04	0.88	6.52E-01	5.27E-01	1.17	6.61E-01	2.75E-01	5.17E+04	6.05E+04
9.07E+04	9.57E+04	1.02E+05	1.40E+05	1.48E+05	1.08E+05	0.91	6.59E-01	5.89E-01	1.17	6.45E-01	2.57E-01	7.37E+04	8.62E+04
1.26E+05	1.76E+05	2.46E+05	2.75E+05	2.75E+05	1.93E+05	0.89	9.26E-01	6.73E-01	1.17	9.84E-01	4.57E-01	1.39E+05	1.62E+05
8.71E+04	1.09E+05	5.20E+04	8.83E+04	1.45E+05	1.30E+05	0.87	9.68E-01	6.44E-01	1.17	1.03E+00	4.78E-01	6.59E+04	7.70E+04
1.07E+06	8.76E+05	8.19E+05	1.35E+06	7.80E+05	1.32E+06	0.91	5.97E-01	5.77E-01	1.17	6.65E-01	2.77E-01	6.32E+05	7.37E+05
2.90E+05	2.63E+05	2.37E+05	7.33E+05	4.00E+05	1.97E+05	0.89	9.83E-01	6.72E-01	1.17	1.08E+00	5.16E-01	1.98E+05	2.31E+05
6.57E+04	1.20E+05	9.41E+04	1.34E+05	1.42E+05	1.58E+05	0.91	1.11E+00	7.68E-01	1.17	1.23E+00	5.55E-01	6.56E+04	7.65E+04
3.83E+04	5.70E+04	8.26E+04	1.09E+05	1.11E+05	7.50E+04	0.89	1.03E+00	7.03E-01	1.17	1.10E+00	5.14E-01	5.25E+04	6.12E+04
3.11E+05	2.97E+05	3.09E+05	4.98E+05	3.90E+05	3.01E+05	0.89	7.59E-01	5.91E-01	1.16	7.76E-01	3.59E-01	2.19E+05	2.55E+05
1.41E+06	1.91E+06	1.57E+06	2.36E+06	2.19E+06	5.28E+06	0.91	1.22E+00	7.67E-01	1.16	1.31E+00	5.84E-01	1.44E+06	1.67E+06
1.37E+05	1.51E+05	1.54E+05	2.64E+05	2.51E+05	1.39E+05	0.88	7.70E-01	5.90E-01	1.16	7.46E-01	3.51E-01	1.12E+05	1.30E+05
3.78E+05	3.20E+05	3.87E+05	7.40E+05	6.34E+05	3.60E+05	0.88	7.67E-01	5.65E-01	1.16	7.44E-01	3.42E-01	2.88E+05	3.35E+05
3.67E+06	4.12E+06	3.10E+06	5.67E+06	4.36E+06	3.56E+06	0.88	6.14E-01	4.96E-01	1.16	6.02E-01	2.49E-01	2.62E+06	3.05E+06
2.28E+05	2.31E+05	2.75E+05	4.65E+05	4.16E+05	3.21E+05	0.90	7.30E-01	6.17E-01	1.16	6.97E-01	3.23E-01	1.97E+05	2.29E+05
1.04E+06	1.33E+06	1.19E+06	1.73E+06	1.21E+06	1.30E+06	0.88	6.63E-01	5.26E-01	1.16	6.61E-01	2.94E-01	8.26E+05	9.60E+05
4.58E+04	8.98E+04	7.73E+04	1.64E+05	2.19E+05	1.44E+05	0.92	1.20E+00	7.92E-01	1.16	1.30E+00	5.94E-01	7.56E+04	8.75E+04
4.66E+04	5.97E+04	8.76E+04	8.00E+04	1.02E+05	8.17E+04	0.88	9.77E-01	6.72E-01	1.16	1.05E+00	5.16E-01	4.74E+04	5.49E+04
2.75E+05	2.83E+05	3.07E+05	5.28E+05	3.77E+05	2.82E+05	0.88	6.43E-01	5.20E-01	1.15	6.63E-01	3.19E-01	2.23E+05	2.57E+05
7.49E+04	1.32E+05	8.71E+04	1.36E+05	1.27E+05	1.74E+05	0.91	1.00E+00	7.39E-01	1.15	1.09E+00	5.40E-01	8.06E+04	9.30E+04
2.13E+05	2.86E+05	2.61E+05	3.27E+05	3.20E+05	2.48E+05	0.89	5.04E-01	4.61E-01	1.15	5.21E-01	2.40E-01	1.78E+05	2.05E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
575771903	Inter alpha-trypsin inhibitor, heavy chain 4	5	GLMLLLNDTQHFSSNNVK	Deamidated(7)Deamidated(14)Oxidation(3)	5.19	3	654.3
755532856	Laminin, alpha 2	17	NMTILETK	Deamidated(1)Oxidation(2)	2.46	2	483.7
165377045	integrin alpha 9	2	VLNLTDNITYFK	Deamidated(3)	3.27	2	664.8
110347564	Truncated ceruloplasmin	2	ELHHLQEQNVSNVFLDKKEFFIGSK	Deamidated(9)	5.47	3	996.8
116014342	Basigin	4	TQLTCSLNSSGVDIVGHR	Carbamidomethyl(5)Deamidated(8)	5.17	3	649.0
225007625	Interleukin-6 receptor subunit beta	3	ETYLETNYTLK	Deamidated(7)	2.94	2	688.3
755537649	Platelet endothelial cell adhesion molecule	8	ASSIMVNITELFPKPK	Deamidated(7)Oxidation(5)	4.47	3	598.0
568966579	Collagen alpha-1(XVIII) chain	1	DGQQNISLLYTEPGASQTQTGASFR	Deamidated(5)	5.73	3	890.8
755522060	Tripeptidyl-peptidase 1	2	DVGSGTTNNSQACAQFLEQYFHNSDLTEFMR	Carbamidomethyl(13)Deamidated(23)Oxidation(30)	7.41	4	896.9
122937370	Multimerin-2	4	NFNDSLHLSLQAIR	Deamidated(3)	3.44	3	534.9
226693367	Lysosomal alpha-glucosidase	2	LENLSSTESGYTATLTR	Deamidated(3)	4.9	2	922.5
6678680	Beta-1,3-N-acetylglucosaminyltransferase lunatic fringe	1	LTGNVVLTCSSAHSR	Carbamidomethyl(10)Deamidated(9)	4.14	3	572.9
568920137	Laminin subunit alpha-5	15	LNVTSPDLFR	Deamidated(2)	3.12	2	581.8
6753798	Prothrombin	2	SRYPHKPEINSTTHPGADLK	Deamidated(10)	5.36	4	563.0
568971832	Integrin alpha-3	2	SLDAYPVLNQAQAMENHTEVHFQK	Deamidated(16)Oxidation(14)	5.76	4	697.6
89242146	Niemann Pick type C1	6	NPNLTSFTAER	Deamidated(3)	4.37	2	682.3
21389311	Intercellular adhesion molecule 1	2	TELDLRPQGLALFSNVSEAR	Deamidated(15)	6.68	3	739.7
755532856	Laminin, alpha 2	17	HMQNLTEEQPIEVK	Deamidated(4)Oxidation(2)	5.81	3	571.6
755556472	Bis(5'-adenosyl)-triphosphatase enpp4	2	INVTEVYDK	Deamidated(2)	2.95	2	541.3
113195678	Lysosomal-associated membrane protein 1	7	DATIQAYLSSGNFSK	Deamidated(12)	4.36	2	801.9
13386130	Mono(ADP-ribosyl)transferase	1	SAGNMSTYNCQLLK	Carbamidomethyl(10)Deamidated(4)Oxidation(5)	3.89	2	802.4
148747408	Laminin subunit alpha-4	7	DAVRNLTEVVPQLLDQLR	Deamidated(5)	4.26	3	694.1
6857783	low affinity immunoglobulin gamma Fc region receptor II-Protein-tyrosine sulfotransferase 2	3	ATVNDSGEYR	Deamidated(4)	2.6	2	556.7
755512334	Protein-tyrosine sulfotransferase 2	1	LGYPYANPPNYGNPDPVIVNNTHR	Deamidated(21)	5.04	3	938.1
31791059	CD166 antigen	3	LSENYTLSIANAK	Deamidated(6)	4.31	2	812.9
302370951	N-acetylgalactosamine-6-sulfatase, isoform 2	1	TGEANLTQLYTQEALDFIQTQHAR	Deamidated(5)	5.58	3	917.1

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1961.0	44.1	351	1.09E+06	2.50E+06	4.23E+06	1.67E+06	3.50E+06	3.74E+06	1.05E+06	2.21E+06	2.78E+06	1.14E+06	2.82E+06
966.5	26.5	6	1.46E+06	1.28E+06	2.25E+06	6.60E+05	2.92E+06	2.33E+06	1.50E+06	1.10E+06	8.01E+05	8.49E+05	1.47E+06
1328.7	45.6	16	3.79E+05	3.47E+05	6.22E+05	1.96E+05	5.96E+05	5.94E+05	2.23E+05	3.66E+05	2.15E+05	1.87E+05	4.80E+05
2988.5	45.9	34	3.86E+05	6.13E+05	9.61E+05	3.95E+05	1.06E+06	1.03E+06	1.30E+05	5.21E+05	4.60E+05	3.27E+05	9.49E+05
1944.9	37.3	60	4.00E+06	3.00E+06	8.61E+06	1.55E+06	1.15E+07	1.08E+07	3.02E+06	5.79E+06	3.75E+06	3.66E+06	7.29E+06
1375.7	38.5	14	2.26E+05	3.06E+05	3.26E+05	1.54E+05	3.92E+05	3.78E+05	2.06E+05	3.03E+05	1.59E+05	1.61E+05	2.94E+05
1792.0	52.0	44	7.70E+05	6.82E+05	1.35E+06	5.18E+05	1.81E+06	1.74E+06	2.51E+05	1.08E+06	5.27E+05	3.42E+05	1.52E+06
2670.3	48.9	26	7.38E+05	9.70E+05	8.55E+05	5.54E+05	1.17E+06	1.05E+06	3.26E+05	7.37E+05	5.74E+05	9.51E+05	6.55E+05
3584.5	57.5	58	3.37E+06	4.06E+06	7.72E+06	3.42E+06	9.89E+06	9.26E+06	6.54E+05	6.73E+06	2.52E+06	1.81E+06	7.62E+06
1602.8	43.3	17	6.77E+05	5.41E+05	9.01E+05	3.17E+05	1.77E+06	1.52E+06	2.99E+05	7.97E+05	4.02E+05	4.62E+05	7.94E+05
1843.9	38.9	9	1.73E+05	1.31E+05	1.33E+05	6.85E+04	2.54E+05	2.09E+05	7.69E+04	1.47E+05	1.04E+05	1.15E+05	1.30E+05
1716.8	26.9	10	4.19E+05	3.43E+05	6.48E+05	4.44E+04	7.15E+05	6.31E+05	3.37E+05	4.44E+05	2.34E+05	2.51E+05	4.14E+05
1162.6	45.6	37	1.84E+06	1.77E+06	3.44E+06	1.18E+06	4.34E+06	4.17E+06	1.56E+06	2.03E+06	1.23E+06	1.65E+06	2.79E+06
2249.1	22.3	28	1.15E+05	1.84E+05	2.29E+05	0.00E+00	4.07E+05	3.59E+05	1.38E+05	7.37E+04	8.32E+04	1.02E+05	1.72E+05
2787.3	37.7	15	1.08E+05	1.17E+05	1.75E+05	5.10E+04	2.34E+05	2.26E+05	8.89E+04	1.64E+05	1.17E+05	6.11E+04	1.37E+05
1363.7	42.3	9	1.82E+05	3.12E+05	4.06E+05	1.06E+05	3.43E+05	2.93E+05	8.30E+04	2.60E+05	1.78E+05	5.25E+04	4.07E+05
2217.2	53.0	19	9.77E+05	1.60E+06	1.76E+06	5.83E+05	1.69E+06	1.58E+06	3.86E+05	1.04E+06	6.08E+05	4.47E+05	1.39E+06
1712.8	28.3	84	2.15E+06	1.82E+06	3.65E+06	1.06E+06	4.58E+06	3.66E+06	2.20E+06	1.78E+06	1.44E+06	1.40E+06	2.72E+06
1081.5	33.7	14	2.45E+05	1.90E+05	3.75E+05	1.46E+05	3.98E+05	3.44E+05	1.81E+05	2.14E+05	1.84E+05	1.46E+05	3.03E+05
1602.8	48.2	91	4.84E+06	6.67E+06	7.39E+06	3.01E+06	9.79E+06	8.77E+06	3.40E+06	5.93E+06	3.49E+06	2.40E+06	8.03E+06
1603.7	31.5	11	4.49E+05	1.95E+05	6.67E+05	1.98E+05	9.94E+05	8.63E+05	4.15E+05	5.53E+05	3.12E+05	2.29E+05	6.36E+05
2080.1	67.6	26	3.91E+05	3.41E+05	8.38E+05	2.70E+05	8.50E+05	8.11E+05	5.95E+04	3.56E+05	1.27E+05	9.28E+04	1.56E+05
1112.5	18.4	10	1.31E+06	1.20E+06	1.29E+06	8.03E+02	1.35E+06	2.28E+02	1.34E+06	1.26E+06	6.12E+05	3.58E+05	8.68E+05
2812.3	44.0	8	1.12E+05	1.12E+05	1.94E+05	9.02E+04	2.39E+05	2.40E+05	5.38E+04	9.30E+04	7.37E+04	4.97E+04	1.15E+05
1624.8	45.3	1	7.76E+04	1.73E+05	1.75E+05	8.72E+04	2.16E+05	2.27E+05	6.69E+04	1.38E+05	6.32E+04	3.69E+04	1.41E+05
2749.3	59.8	8	8.77E+04	9.36E+04	1.13E+05	2.72E+04	1.53E+05	1.47E+05	2.04E+04	9.34E+04	6.71E+04	4.37E+04	1.05E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.63E+06	1.68E+06	2.19E+06	2.75E+06	1.86E+06	3.68E+06	0.93	7.33E-01	6.99E-01	1.15	8.97E-01	4.64E-01	1.51E+06	1.74E+06
9.79E+05	1.30E+06	1.14E+06	2.39E+06	1.66E+06	1.31E+06	0.87	7.19E-01	5.18E-01	1.15	6.55E-01	3.24E-01	8.88E+05	1.02E+06
2.11E+05	2.91E+05	3.50E+05	5.37E+05	3.85E+05	3.66E+05	0.89	6.98E-01	5.64E-01	1.15	6.86E-01	3.48E-01	2.24E+05	2.58E+05
5.68E+05	3.92E+05	4.08E+05	6.64E+05	5.00E+05	5.60E+05	0.89	7.87E-01	5.93E-01	1.15	8.77E-01	4.65E-01	3.55E+05	4.07E+05
4.01E+06	3.94E+06	5.25E+06	5.10E+06	6.03E+06	5.05E+06	0.87	7.60E-01	5.81E-01	1.15	7.96E-01	4.44E-01	3.28E+06	3.76E+06
1.88E+05	1.98E+05	2.55E+05	3.37E+05	3.09E+05	2.09E+05	0.90	5.29E-01	4.62E-01	1.15	5.40E-01	2.44E-01	1.58E+05	1.81E+05
6.57E+05	6.39E+05	7.13E+05	1.31E+06	9.59E+05	7.61E+05	0.89	9.08E-01	6.47E-01	1.15	9.77E-01	5.14E-01	5.50E+05	6.31E+05
4.56E+05	6.13E+05	6.08E+05	7.48E+05	7.88E+05	6.36E+05	0.88	4.94E-01	3.84E-01	1.15	7.08E-01	3.79E-01	4.53E+05	5.20E+05
2.76E+06	3.49E+06	3.26E+06	7.55E+06	6.06E+06	5.67E+06	0.90	9.72E-01	7.05E-01	1.15	1.04E+00	5.39E-01	3.00E+06	3.44E+06
6.62E+05	6.32E+05	6.56E+05	9.18E+05	7.01E+05	6.63E+05	0.86	7.21E-01	5.36E-01	1.15	7.51E-01	4.35E-01	4.49E+05	5.14E+05
7.89E+04	1.19E+05	1.11E+05	1.87E+05	1.34E+05	1.61E+05	0.90	6.03E-01	5.35E-01	1.15	5.98E-01	3.04E-01	8.38E+04	9.60E+04
2.56E+05	3.86E+05	2.69E+05	4.78E+05	4.27E+05	5.41E+05	0.89	7.10E-01	5.81E-01	1.14	6.66E-01	3.68E-01	2.43E+05	2.78E+05
1.53E+06	1.88E+06	1.90E+06	2.72E+06	2.17E+06	1.78E+06	0.86	6.41E-01	4.57E-01	1.14	6.35E-01	3.43E-01	1.34E+06	1.54E+06
1.48E+05	1.25E+05	1.13E+05	1.24E+05	9.57E+04	3.07E+05	0.84	1.03E+00	5.90E-01	1.14	1.12E+00	5.80E-01	9.66E+04	1.10E+05
1.11E+05	1.14E+05	1.18E+05	2.08E+05	1.35E+05	1.58E+05	0.91	6.91E-01	6.32E-01	1.14	7.31E-01	4.04E-01	8.38E+04	9.57E+04
1.51E+05	1.88E+05	1.33E+05	2.96E+05	2.54E+05	3.16E+05	0.93	9.04E-01	7.77E-01	1.14	1.00E+00	5.51E-01	1.42E+05	1.62E+05
7.90E+05	8.07E+05	7.93E+05	1.34E+06	1.31E+06	1.30E+06	0.90	7.36E-01	6.09E-01	1.14	7.39E-01	4.13E-01	6.53E+05	7.45E+05
1.61E+06	1.93E+06	1.80E+06	3.18E+06	2.48E+06	2.08E+06	0.87	6.58E-01	4.76E-01	1.14	5.90E-01	3.13E-01	1.40E+06	1.59E+06
1.67E+05	1.91E+05	2.57E+05	2.85E+05	2.50E+05	1.80E+05	0.88	5.60E-01	4.30E-01	1.14	5.78E-01	3.03E-01	1.46E+05	1.66E+05
3.73E+06	4.90E+06	4.08E+06	7.41E+06	6.02E+06	5.76E+06	0.89	6.89E-01	5.60E-01	1.14	6.90E-01	3.92E-01	3.41E+06	3.88E+06
2.74E+05	2.80E+05	6.15E+05	4.20E+05	6.36E+05	5.40E+05	0.88	8.19E-01	5.88E-01	1.14	8.73E-01	4.97E-01	2.93E+05	3.33E+05
2.66E+05	2.09E+05	3.23E+05	9.41E+05	6.63E+05	5.03E+05	0.88	1.24E+00	7.08E-01	1.14	1.36E+00	6.72E-01	2.45E+05	2.79E+05
4.92E+05	7.49E+05	8.25E+05	1.58E+06	9.60E+05	1.18E+06	0.94	9.95E-01	8.25E-01	1.14	1.06E+00	5.78E-01	5.59E+05	6.35E+05
1.00E+05	1.13E+05	1.05E+05	1.64E+05	1.66E+05	1.14E+05	0.86	7.34E-01	5.12E-01	1.14	6.99E-01	4.08E-01	7.50E+04	8.52E+04
6.19E+04	1.07E+05	8.99E+04	2.05E+05	1.65E+05	1.76E+05	0.90	8.60E-01	6.64E-01	1.13	8.72E-01	5.12E-01	7.74E+04	8.78E+04
5.58E+04	6.38E+04	5.75E+04	1.36E+05	1.11E+05	7.48E+04	0.91	8.35E-01	6.74E-01	1.13	8.48E-01	4.97E-01	5.21E+04	5.90E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
153791270	Laminin subunit gamma-1	12	MAAANVSITQPESTGEPNNMTLLAE EAR	Deamidated(18)Deamidated(19)Oxidation(1)Oxidation(20)	7.7	3	993.8
156616286	Collagen alpha-6(VI) chain	11	QMGGNTNTGAALNFTLK	Deamidated(13)Oxidation(2)	4.91	2	877.9
156616286	Collagen alpha-6(VI) chain	11	VGLVTVSNETR	Deamidated(8)	3.68	2	620.3
568962784	Laminin subunit beta-2	4	ANASTFAVPSVNSADTR	Deamidated(2)	4.8	2	947.0
153791270	Laminin subunit gamma-1	12	FLGNQVLSYGQNLFSFR	Deamidated(12)	5.96	2	1039.5
148747408	Laminin subunit alpha-4	7	HVTDMNSTIHLR	Deamidated(6)Oxidation(5)	4.76	3	518.6
19527130	EMILIN-1	7	LNLTAQLSQLEGLLQAR	Deamidated(2)	6.38	2	970.5
6755775	Transforming growth factor beta-1	2	LASPPSQGEVPPGPLPEAVLALYNSTR	Deamidated(24)	5.56	3	921.2
755517036	complement component C1SA	1	GVDSCHGDSGGAFQVPNVTPK	Carbamidomethyl(5)Deamidated(19)	3.79	3	816.4
568973925	Delta-sarcoglycan	1	NVTVNILNDQTK	Deamidated(1)	3.89	2	680.4
45429999	Toll-like receptor 13	3	IQSVNNSFEGLSSLK	Deamidated(6)	3.36	2	812.4
85719301	carcinoembryonic antigen-related cell adhesion molecule 1	4	EIIYSNGSLLFQMITMK	Deamidated(6)Oxidation(13)Oxidation(16)	4.06	3	674.3
153791389	Integrin alpha-1	13	HFFNVSDELALVTIVK	Deamidated(4)	4.46	3	611.7
755500860	GPI transamidase component PIG-T	2	TYAVYDLFDTAMINNSR	Deamidated(14)Oxidation(12)	3.99	2	1006.0
568920137	Laminin subunit alpha-5	15	LEVDTQSNHTTGR	Deamidated(8)	3.47	2	729.8
568956867	CD97 antigen	2	DFNPATVNYTIQK	Deamidated(8)	3.73	2	756.4
89242146	Niemann Pick type C1	6	TEQLIIQAPNTSVHIYEPYPAGADVPGPPLNK	Deamidated(10)	4.75	4	895.2
27370240	Leucyl-cystinyl aminopeptidase	8	DIILHSTGHNISR	Deamidated(10)	3.47	2	732.4
19527008	Group XV phospholipase A2	2	VSLQELPGSEHIEMLANATTLAYLK	Deamidated(17)Oxidation(14)	4.69	3	915.8
22203747	Collagen alpha-2(VI) chain	6	NMTLFSDLVAEK	Deamidated(1)Oxidation(2)	3.81	2	692.8
568913811	Protein GPR107	1	DGYMVVNVSSLSVNEPEGATDKDAEIGFSLDR	Deamidated(7)Oxidation(4)	7.99	3	1144.5
156616286	Collagen alpha-6(VI) chain	11	DLSVFAPNMTEIHK	Deamidated(8)Oxidation(9)	3.13	2	797.9
122937370	Multimerin-2	4	AQELPGANGSLVMASAAAAARPEPESLQAR	Deamidated(8)Oxidation(13)	4.4	3	994.2
29789239	N-acetylglucosamine-6-sulfatase	1	YYNYTSLINGK	Deamidated(3)Deamidated(9)	2.63	2	669.3
153791270	Laminin subunit gamma-1	12	LLNNLTSIK	Deamidated(4)	2.59	2	508.8
133778978	Cation-independent mannose-6-phosphate receptor	12	HGNLYDLKPLGLNDTIVSVGEYTYLRLR	Deamidated(13)	6.57	4	779.4
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	EDFASNEVVYNAKDDLDPERNES EPGSQR	Deamidated(22)	4.88	4	869.4
568909422	hemocentin 1	2	YDLSVHAPPSIIGNHGVPEVSVVEK	Deamidated(20)	4	4	690.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2979.4	42.3	76	2.16E+06	2.50E+06	4.09E+06	1.71E+06	7.68E+06	6.75E+06	1.84E+06	3.95E+06	1.77E+06	2.06E+06	4.44E+06
1754.8	40.9	18	2.02E+05	1.91E+05	4.24E+05	1.66E+05	4.83E+05	4.58E+05	1.06E+05	2.83E+05	1.41E+05	1.63E+05	3.59E+05
1239.6	31.7	25	1.34E+06	1.28E+06	2.13E+06	9.13E+05	3.03E+06	2.70E+06	1.17E+06	1.61E+06	9.75E+05	1.08E+06	1.71E+06
1892.9	39.3	77	9.14E+05	1.10E+06	1.61E+06	8.07E+05	2.24E+06	2.07E+06	1.01E+06	8.03E+05	6.22E+05	8.16E+05	1.37E+06
2078.0	59.7	115	9.21E+05	1.06E+06	2.48E+06	7.06E+05	1.66E+06	1.38E+06	1.94E+05	1.34E+06	5.12E+05	2.67E+05	9.93E+05
1553.8	28.8	45	3.60E+06	3.51E+06	6.14E+06	4.24E+05	7.94E+06	6.75E+06	3.71E+06	3.13E+06	2.63E+06	2.45E+06	3.91E+06
1940.1	64.0	153	6.60E+04	9.67E+04	1.59E+05	6.16E+04	1.78E+05	1.71E+05	3.20E+03	1.13E+05	3.54E+04	4.85E+04	1.55E+05
2761.4	64.7	41	2.96E+05	7.42E+05	8.40E+05	2.55E+05	8.87E+05	7.98E+05	9.31E+04	5.00E+05	2.49E+05	2.22E+05	5.10E+05
2447.1	47.6	3	3.80E+04	8.89E+04	1.49E+05	4.51E+04	1.26E+05	1.37E+05	2.43E+04	3.89E+04	3.08E+04	3.41E+04	1.05E+05
1359.7	40.4	25	7.30E+05	5.09E+05	9.36E+05	6.00E+05	1.35E+06	1.26E+06	4.97E+05	7.74E+05	4.83E+05	5.02E+05	8.90E+05
1623.8	43.8	12	1.70E+05	1.26E+05	1.34E+05	4.87E+04	1.44E+05	1.13E+05	1.12E+05	9.92E+04	6.87E+04	4.34E+04	1.18E+05
2021.0	56.9	61	4.69E+05	4.67E+05	9.46E+05	3.43E+05	1.14E+06	9.08E+05	1.78E+05	6.42E+05	4.89E+05	3.32E+05	7.32E+05
1833.0	60.9	1	1.24E+05	2.31E+05	3.54E+05	9.72E+04	2.08E+05	1.38E+05	3.80E+04	1.62E+05	6.55E+04	1.72E+04	1.27E+05
2010.9	55.9	36	1.85E+05	2.62E+05	2.60E+05	1.32E+05	3.98E+05	3.09E+05	1.09E+05	2.15E+05	1.36E+05	1.29E+05	2.49E+05
1458.7	19.8	13	1.27E+05	1.13E+05	1.75E+05	1.56E+01	2.29E+05	2.21E+05	8.68E+04	1.12E+05	7.63E+04	6.71E+04	1.35E+05
1511.7	42.4	14	3.96E+05	4.67E+05	6.78E+05	3.09E+05	8.47E+05	6.91E+05	3.66E+05	3.57E+05	2.78E+05	2.41E+05	5.18E+05
3577.8	56.3	9	2.41E+05	3.52E+05	4.91E+05	1.56E+05	4.51E+05	3.79E+05	3.00E+04	2.87E+05	1.21E+05	7.85E+04	3.50E+05
1463.8	26.4	39	1.72E+06	1.33E+06	2.26E+06	9.59E+02	2.38E+06	1.79E+06	1.14E+06	1.12E+06	8.82E+05	6.84E+05	1.33E+06
2745.4	57.7	14	2.04E+05	2.37E+05	2.70E+05	9.30E+04	3.68E+05	3.24E+05	3.71E+04	2.15E+05	1.27E+05	6.91E+04	2.04E+05
1384.7	52.8	101	1.42E+07	1.18E+07	2.65E+07	1.13E+07	4.22E+07	4.13E+07	1.15E+07	2.32E+07	1.04E+07	1.14E+07	1.91E+07
3431.6	54.0	15	2.15E+05	3.37E+05	5.74E+05	1.57E+05	3.68E+05	3.23E+05	3.87E+04	2.61E+05	1.07E+05	4.52E+04	3.99E+05
1594.8	52.7	23	8.14E+05	9.11E+05	1.79E+06	9.06E+05	2.10E+06	2.02E+06	6.79E+05	1.60E+06	7.39E+05	7.85E+05	1.64E+06
2980.5	40.8	16	3.09E+05	2.10E+05	3.86E+05	1.55E+05	7.42E+05	5.85E+05	1.44E+05	2.68E+05	1.49E+05	1.80E+05	3.70E+05
1337.6	40.7	1	1.37E+05	1.04E+05	1.90E+05	7.86E+04	2.32E+05	1.90E+05	4.51E+04	8.97E+04	6.57E+04	8.27E+04	1.69E+05
1016.6	39.1	62	2.00E+05	2.47E+05	3.24E+05	1.34E+05	5.40E+05	4.74E+05	2.22E+05	2.40E+05	1.81E+05	1.95E+05	2.85E+05
3114.6	58.4	21	2.88E+05	3.88E+05	4.64E+05	1.89E+05	3.99E+05	3.25E+05	2.37E+04	2.94E+05	1.64E+05	9.63E+04	2.04E+05
3474.5	37.8	8	9.54E+04	3.71E+04	1.43E+05	3.29E+04	1.80E+05	1.98E+05	1.98E+04	4.51E+04	5.16E+04	8.04E+04	7.87E+04
2758.4	42.8	3	3.98E+05	7.36E+05	5.88E+05	1.19E+05	6.35E+05	5.39E+05	3.65E+05	2.93E+05	1.02E+05	1.67E+05	3.74E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.07E+06	2.78E+06	2.77E+06	4.37E+06	3.39E+06	2.90E+06	0.86	7.88E-01	5.44E-01	1.13	8.03E-01	4.89E-01	2.02E+06	2.29E+06
1.73E+05	2.44E+05	1.54E+05	3.02E+05	2.28E+05	2.55E+05	0.86	7.23E-01	5.04E-01	1.13	7.55E-01	4.53E-01	1.54E+05	1.74E+05
1.16E+06	1.43E+06	1.28E+06	1.81E+06	1.66E+06	1.45E+06	0.86	5.49E-01	4.08E-01	1.13	4.88E-01	2.92E-01	9.56E+05	1.08E+06
9.13E+05	9.11E+05	7.58E+05	1.52E+06	1.09E+06	1.00E+06	0.84	6.14E-01	3.91E-01	1.13	5.67E-01	3.25E-01	6.91E+05	7.81E+05
6.83E+05	7.01E+05	7.47E+05	2.09E+06	1.56E+06	1.20E+06	0.91	1.05E+00	7.28E-01	1.13	1.12E+00	6.14E-01	6.50E+05	7.35E+05
2.80E+06	3.60E+06	2.98E+06	5.34E+06	4.08E+06	3.94E+06	0.86	6.95E-01	5.12E-01	1.13	6.42E-01	4.09E-01	2.38E+06	2.69E+06
5.87E+04	6.51E+04	5.27E+04	7.94E+04	1.15E+05	1.06E+05	0.87	9.27E-01	6.00E-01	1.13	1.02E+00	5.90E-01	5.50E+04	6.20E+04
4.69E+05	3.78E+05	3.70E+05	6.89E+05	5.04E+05	4.42E+05	0.87	7.69E-01	5.46E-01	1.13	8.46E-01	5.30E-01	2.95E+05	3.32E+05
7.99E+04	5.34E+04	3.26E+04	4.72E+04	7.55E+04	7.18E+04	0.83	8.84E-01	5.09E-01	1.12	1.06E+00	6.13E-01	4.14E+04	4.66E+04
4.50E+05	5.02E+05	6.84E+05	1.00E+06	9.49E+05	5.03E+05	0.86	6.45E-01	4.43E-01	1.12	6.16E-01	3.92E-01	4.51E+05	5.07E+05
1.07E+05	7.47E+04	9.51E+04	1.78E+05	9.95E+04	7.87E+04	0.88	6.39E-01	4.80E-01	1.12	7.23E-01	4.79E-01	6.56E+04	7.38E+04
6.26E+05	4.39E+05	4.93E+05	6.97E+05	5.64E+05	4.03E+05	0.86	6.70E-01	4.84E-01	1.12	7.85E-01	5.07E-01	3.60E+05	4.03E+05
8.11E+04	1.10E+05	1.03E+05	2.66E+05	2.47E+05	1.98E+05	0.91	1.10E+00	7.59E-01	1.12	1.19E+00	6.63E-01	9.04E+04	1.01E+05
1.50E+05	1.67E+05	1.62E+05	2.56E+05	2.53E+05	1.83E+05	0.87	5.98E-01	4.40E-01	1.12	5.53E-01	3.66E-01	1.28E+05	1.43E+05
1.02E+05	8.70E+04	1.06E+05	1.41E+05	1.03E+05	1.25E+05	0.86	6.87E-01	4.94E-01	1.12	6.97E-01	4.90E-01	7.22E+04	8.08E+04
3.56E+05	3.32E+05	3.97E+05	5.48E+05	4.34E+05	5.00E+05	0.85	5.66E-01	3.66E-01	1.12	4.84E-01	3.04E-01	2.76E+05	3.08E+05
1.49E+05	1.95E+05	1.52E+05	3.90E+05	3.37E+05	3.26E+05	0.89	9.13E-01	6.43E-01	1.12	9.56E-01	5.96E-01	1.58E+05	1.77E+05
9.04E+05	1.00E+06	1.27E+06	1.65E+06	1.52E+06	1.40E+06	0.87	6.90E-01	5.12E-01	1.12	6.51E-01	4.68E-01	8.05E+05	8.98E+05
1.47E+05	1.86E+05	1.27E+05	2.82E+05	2.22E+05	2.34E+05	0.88	7.80E-01	5.78E-01	1.12	7.90E-01	5.32E-01	1.20E+05	1.34E+05
1.01E+07	1.36E+07	1.56E+07	3.05E+07	2.74E+07	1.92E+07	0.86	8.62E-01	5.61E-01	1.12	8.44E-01	5.61E-01	1.20E+07	1.34E+07
1.36E+05	1.93E+05	2.10E+05	3.14E+05	2.81E+05	2.81E+05	0.88	9.49E-01	6.34E-01	1.11	1.06E+00	6.44E-01	1.50E+05	1.68E+05
8.66E+05	1.17E+06	8.85E+05	1.25E+06	1.08E+06	1.13E+06	0.86	6.01E-01	4.12E-01	1.11	6.67E-01	4.73E-01	7.38E+05	8.22E+05
1.93E+05	2.31E+05	2.42E+05	3.75E+05	3.70E+05	2.20E+05	0.83	7.92E-01	4.87E-01	1.11	7.71E-01	5.39E-01	1.81E+05	2.01E+05
7.58E+04	9.97E+04	8.28E+04	1.24E+05	1.09E+05	9.61E+04	0.83	6.70E-01	4.04E-01	1.11	6.85E-01	4.83E-01	7.03E+04	7.82E+04
2.10E+05	2.30E+05	2.20E+05	2.88E+05	2.15E+05	2.73E+05	0.84	5.34E-01	3.64E-01	1.11	5.17E-01	3.87E-01	1.62E+05	1.80E+05
1.47E+05	2.60E+05	1.69E+05	4.76E+05	4.12E+05	2.60E+05	0.90	9.02E-01	6.67E-01	1.11	9.55E-01	6.17E-01	1.64E+05	1.82E+05
5.03E+04	3.47E+04	5.43E+04	1.40E+05	1.08E+05	3.94E+04	0.82	1.04E+00	5.54E-01	1.11	1.17E+00	6.86E-01	4.90E+04	5.45E+04
2.38E+05	3.07E+05	2.62E+05	6.05E+05	4.56E+05	4.65E+05	0.86	8.00E-01	5.17E-01	1.11	8.63E-01	5.88E-01	2.35E+05	2.61E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
170650603	EGF, latrophilin seven transmembrane domain-containing protein 1	2	NSQFDMNSTDLALK	Deamidated(7)Oxidation(6)	3.77	2	800.9
165377045	integrin alpha 9	2	NVPGEIGLNLYNLTAQK	Deamidated(11)	4.05	2	1009.0
75532856	Laminin, alpha 2	17	NLSLNIHGK	Deamidated(1)	2.54	2	498.8
150378501	Carboxypeptidase D	4	DSVTGSGLENATISVAGINHNITTGR	Deamidated(10)Deamidated(21)	7.42	3	862.8
34328417	Sarcalumenin	2	TNVSKFDLPNR	Deamidated(2)	3.02	2	646.3
161702988	Apolipoprotein B-100	2	LSTSPFALNLTMLPK	Deamidated(9)Oxidation(12)	3.34	2	825.4
156231021	Kininogen-1	2	HSIEHFNNNTDHSFLFTR	Deamidated(7)Deamidated(8)	5.68	4	580.8
112293269	Integrin alpha 7	3	NVTLDCAQGTAK	Carbamidomethyl(6)Deamidated(1)	3.09	2	639.8
568998451	Protein ITFG3	1	KPILGHYKPDTLAVVIENGTSIDR	Deamidated(18)	4.8	4	660.1
358030288	Extracellular matrix protein 1	2	NVALVAGDTGNATGLGEQGPTR	Deamidated(1)Deamidated(11)	5.88	2	1050.0
153791270	Laminin subunit gamma-1	12	VNDNKTAEEALR	Deamidated(4)	4.02	3	477.9
568972029	C-type mannose receptor 2	6	KPNATVEPIQPDR	Deamidated(3)	4.55	3	489.3
34328278	Vesicular integral-membrane protein VIP36	1	VFPYISVMVNNGLSYDHSK	Deamidated(10)Deamidated(11)Oxidation(8)	3.59	2	1137.5
23346525	CD109 antigen	3	DQEMDYIQTVNYTIPQNGIHK	Deamidated(11)Deamidated(17)Oxidation(4)	5.45	3	834.4
569003077	Cadherin-2	6	VDVIVANLTVTDK	Deamidated(7)	3.91	2	694.4
568920137	Laminin subunit alpha-5	15	GVHNASLALSANIGR	Deamidated(4)	4.45	3	494.3
568916058	Sialoadhesin	2	ANTSLELLLEGVR	Deamidated(2)	4.32	2	708.4
569000449	Latent-transforming growth factor beta-binding protein 1	2	YGQEQGTAPFQVSNHTGR	Deamidated(14)	3.51	2	989.5
6755466	Semaphorin-7A	1	EDNPDKNPEAPLNVSRL	Deamidated(13)	4.35	3	599.3
339895744	Collagen alpha 3 chain type	5	QLINALQINNTAVGHALVLPAR	Deamidated(9)	8.42	3	776.4
254588077	Multimerin-1	3	DTEENLHVLNQLTSEVIFPMDIK	Deamidated(10)Oxidation(20)	4.12	3	901.4
568922746	Ring finger protein 13	1	DNSSGTFIVLIR	Deamidated(2)	2.9	2	661.8
31542814	Fibroleukin	3	LDGSTNFTTR	Deamidated(6)	3.22	2	506.2
133778955	H-2 class I histocompatibility antigen, alpha chain (Fragment) MHC class Ia H2-K antigen (Fragment) mRNA	1	NGNATLLR	Deamidated(1)Deamidated(3)	2.95	2	430.2
27369644	Inter-alpha-trypsin inhibitor heavy chain H5	2	TLFPNYFNGSEIVIAGK	Deamidated(8)	3.86	2	936.0
49457857	Myelin protein zero-like protein 1	2	EIFVVNGTQGK	Deamidated(6)	2.61	2	596.8
568971816	Intercellular adhesion molecule 2	6	DGLNFSCQAELDLRPHGGYIIR	Carbamidomethyl(7)Deamidated(4)	4.27	4	633.8
568971816	Intercellular adhesion molecule 2	6	GRETLLKNQTFGGAETVPQEATATFNSTALK	Deamidated(7)Deamidated(25)	3.96	4	793.1
569018167	Tenascin-X	2	GPFDSEFVVQYQDTENETQALLVDGQDK	Deamidated(15)	4.75	3	1053.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1600.7	36.0	16	1.19E+05	7.75E+04	1.43E+05	6.33E+04	2.03E+05	1.84E+05	8.02E+04	8.27E+04	6.56E+04	5.59E+04	1.05E+05
2017.0	48.5	26	7.00E+04	1.02E+05	1.77E+05	6.40E+04	1.85E+05	1.51E+05	1.65E+04	1.27E+05	5.80E+04	4.19E+04	1.59E+05
996.5	28.9	4	1.48E+05	1.74E+05	2.66E+05	7.42E+04	2.96E+05	2.26E+05	1.03E+05	1.26E+05	7.53E+04	8.30E+04	1.63E+05
2586.3	47.9	16	2.73E+05	3.40E+05	3.49E+05	1.54E+05	4.24E+05	3.99E+05	1.15E+05	2.35E+05	1.50E+05	1.22E+05	2.48E+05
1291.7	30.4	10	2.53E+05	8.85E+04	2.81E+05	7.28E+04	6.85E+05	5.56E+05	1.25E+05	2.07E+05	2.13E+05	1.74E+05	1.36E+05
1649.9	56.2	18	6.81E+04	1.47E+05	2.01E+05	1.07E+05	2.07E+05	1.62E+05	7.02E+04	1.00E+05	1.96E+05	7.35E+04	1.17E+05
2320.1	30.2	47	1.02E+05	9.84E+04	1.85E+05	6.10E+04	2.57E+05	1.88E+05	3.75E+04	7.89E+04	8.65E+04	7.77E+04	6.56E+04
1278.6	25.9	14	9.20E+04	5.79E+04	1.58E+05	8.02E+02	1.87E+05	1.61E+05	8.02E+04	7.34E+04	5.13E+04	4.48E+04	1.02E+05
2637.4	41.9	4	6.17E+04	6.69E+04	1.34E+05	2.76E+04	1.36E+05	1.37E+05	1.53E+04	6.92E+04	4.02E+04	3.39E+04	7.71E+04
2099.0	38.1	31	5.10E+05	3.99E+05	9.36E+05	3.79E+05	1.42E+06	1.24E+06	3.19E+05	8.41E+05	5.33E+05	5.94E+05	7.60E+05
1431.7	23.1	22	3.49E+05	1.22E+05	2.27E+05	5.48E+04	5.76E+05	5.03E+05	1.24E+05	1.42E+05	1.07E+05	1.84E+05	1.12E+05
1465.8	24.4	23	6.52E+05	4.96E+05	8.15E+05	1.08E+05	9.41E+05	7.61E+05	4.31E+05	4.81E+05	3.25E+05	2.57E+05	5.22E+05
2274.1	46.6	55	1.50E+05	1.76E+05	3.51E+05	1.15E+05	2.93E+05	2.54E+05	3.91E+04	1.90E+05	8.93E+04	6.55E+04	2.06E+05
2501.2	55.2	18	1.33E+05	1.98E+05	2.59E+05	1.13E+05	2.89E+05	2.58E+05	6.29E+04	1.20E+05	9.34E+04	6.93E+04	1.45E+05
1387.8	47.4	12	5.66E+04	6.65E+04	1.78E+05	7.61E+04	2.30E+05	2.29E+05	4.26E+04	2.89E+05	1.67E+05	3.82E+04	3.61E+05
1480.8	33.8	12	4.04E+05	4.05E+05	6.87E+05	2.49E+05	1.04E+06	1.09E+06	1.69E+05	5.42E+05	2.83E+05	2.33E+05	7.99E+05
1415.8	57.0	18	3.83E+05	2.77E+05	3.09E+05	1.06E+05	4.74E+05	3.55E+05	9.14E+04	2.69E+05	9.62E+04	8.12E+04	2.98E+05
1977.9	28.4	21	3.81E+05	3.06E+05	6.11E+05	2.95E+05	8.57E+05	7.18E+05	3.01E+05	3.92E+05	1.79E+05	2.66E+05	4.30E+05
1795.8	27.2	12	2.29E+05	1.07E+05	2.67E+05	1.48E+05	4.90E+05	3.53E+05	1.43E+05	2.03E+05	1.89E+05	1.76E+05	3.17E+05
2327.3	51.6	246	1.83E+05	1.93E+05	3.57E+05	1.70E+05	7.25E+05	7.26E+05	5.32E+04	4.13E+05	1.08E+05	9.13E+04	4.34E+05
2702.3	66.4	18	1.83E+05	4.30E+05	5.91E+05	2.80E+05	4.78E+05	4.69E+05	4.41E+04	4.19E+05	1.39E+05	6.67E+04	1.61E+05
1322.7	55.7	7	1.15E+05	1.32E+05	1.56E+05	8.03E+04	1.94E+05	1.70E+05	7.91E+04	1.14E+05	1.20E+05	4.70E+04	1.60E+05
1011.5	25.9	16	3.37E+05	2.38E+05	5.02E+05	1.67E+04	8.30E+05	7.15E+05	4.21E+05	4.03E+05	2.53E+05	2.07E+05	4.63E+05
859.5	26.4	33	2.72E+06	1.99E+06	2.93E+06	1.28E+06	3.57E+06	3.40E+06	1.68E+06	2.05E+06	1.01E+06	1.27E+06	2.78E+06
1871.0	57.7	11	1.39E+05	1.14E+05	1.81E+05	1.09E+05	2.84E+05	2.12E+05	3.24E+04	1.84E+05	8.61E+04	1.01E+05	1.50E+05
1192.6	35.3	1	1.81E+05	2.47E+05	3.12E+05	1.28E+05	3.22E+05	2.78E+05	1.87E+05	2.02E+05	1.52E+05	1.17E+05	1.92E+05
2532.2	46.8	6	8.53E+04	6.03E+04	2.09E+05	4.24E+04	2.19E+05	2.20E+05	1.76E+04	9.84E+04	3.90E+04	1.86E+04	1.71E+05
3169.6	41.1	8	7.76E+04	8.54E+04	1.34E+05	3.93E+04	3.06E+05	3.31E+05	5.93E+04	1.81E+05	4.94E+04	9.29E+04	1.63E+05
3159.4	65.7	22	1.00E+05	6.65E+04	1.74E+05	6.96E+04	2.19E+05	2.90E+05	2.42E+04	1.71E+05	7.37E+04	8.20E+04	1.75E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
8.64E+04	7.02E+04	9.07E+04	1.27E+05	1.25E+05	1.04E+05	0.84	6.12E-01	3.84E-01	1.11	5.29E-01	3.96E-01	6.37E+04	7.06E+04
5.96E+04	7.65E+04	9.02E+04	1.40E+05	7.63E+04	8.42E+04	0.86	8.49E-01	5.51E-01	1.11	9.51E-01	6.30E-01	6.06E+04	6.71E+04
1.02E+05	1.16E+05	8.07E+04	2.67E+05	2.00E+05	1.14E+05	0.85	8.14E-01	5.01E-01	1.11	7.98E-01	5.71E-01	9.27E+04	1.03E+05
1.68E+05	1.82E+05	2.55E+05	3.14E+05	3.12E+05	2.69E+05	0.86	6.22E-01	4.29E-01	1.11	5.89E-01	4.44E-01	1.55E+05	1.72E+05
2.12E+05	1.36E+05	1.91E+05	3.52E+05	5.50E+05	1.19E+05	0.85	1.18E+00	6.40E-01	1.11	1.24E+00	7.14E-01	1.55E+05	1.71E+05
1.60E+05	8.48E+04	1.22E+05	1.86E+05	1.08E+05	1.56E+05	0.90	6.34E-01	5.54E-01	1.11	9.45E-01	6.38E-01	8.54E+04	9.44E+04
1.09E+05	8.51E+04	7.73E+04	2.16E+05	9.45E+04	8.41E+04	0.83	8.89E-01	5.01E-01	1.10	9.62E-01	6.45E-01	6.86E+04	7.58E+04
4.38E+04	6.83E+04	6.17E+04	1.26E+05	1.39E+05	6.68E+04	0.85	9.22E-01	5.66E-01	1.10	9.08E-01	6.25E-01	5.36E+04	5.92E+04
4.85E+04	4.18E+04	5.08E+04	9.84E+04	1.20E+05	5.34E+04	0.86	9.33E-01	5.81E-01	1.10	9.33E-01	6.37E-01	4.31E+04	4.75E+04
4.20E+05	4.33E+05	6.85E+05	8.02E+05	8.00E+05	4.62E+05	0.85	6.89E-01	4.60E-01	1.10	7.67E-01	5.75E-01	4.21E+05	4.65E+05
1.56E+05	1.33E+05	1.60E+05	4.29E+05	2.79E+05	1.36E+05	0.81	1.06E+00	5.38E-01	1.10	1.17E+00	7.06E-01	1.34E+05	1.47E+05
3.43E+05	4.23E+05	4.95E+05	6.57E+05	5.89E+05	5.23E+05	0.86	6.35E-01	4.29E-01	1.10	5.89E-01	4.70E-01	3.18E+05	3.51E+05
9.47E+04	1.45E+05	1.42E+05	2.01E+05	2.36E+05	1.81E+05	0.86	7.86E-01	5.29E-01	1.10	7.90E-01	5.87E-01	1.05E+05	1.15E+05
1.28E+05	1.30E+05	1.45E+05	2.07E+05	1.62E+05	1.52E+05	0.84	6.37E-01	3.94E-01	1.10	6.28E-01	5.06E-01	9.58E+04	1.05E+05
1.05E+05	6.76E+04	1.44E+05	9.70E+04	1.65E+05	1.23E+05	0.93	1.23E+00	8.20E-01	1.10	1.55E+00	7.87E-01	9.17E+04	1.01E+05
2.89E+05	4.16E+05	3.15E+05	6.47E+05	5.05E+05	4.50E+05	0.85	8.76E-01	5.32E-01	1.10	9.22E-01	6.47E-01	3.04E+05	3.35E+05
1.12E+05	1.64E+05	1.66E+05	3.36E+05	3.52E+05	3.18E+05	0.87	8.71E-01	5.78E-01	1.10	8.81E-01	6.33E-01	1.48E+05	1.63E+05
2.83E+05	3.14E+05	3.32E+05	5.03E+05	4.42E+05	3.75E+05	0.82	6.02E-01	3.43E-01	1.10	5.24E-01	4.59E-01	2.49E+05	2.73E+05
1.44E+05	1.44E+05	1.99E+05	2.38E+05	1.84E+05	1.77E+05	0.84	6.66E-01	4.05E-01	1.10	7.28E-01	5.68E-01	1.35E+05	1.49E+05
1.80E+05	1.64E+05	2.14E+05	3.95E+05	3.63E+05	3.56E+05	0.84	1.05E+00	6.05E-01	1.10	1.14E+00	7.19E-01	1.80E+05	1.98E+05
2.22E+05	1.35E+05	3.29E+05	5.75E+05	5.38E+05	3.48E+05	0.88	1.03E+00	6.60E-01	1.10	1.15E+00	7.24E-01	1.93E+05	2.12E+05
6.81E+04	1.07E+05	8.79E+04	1.35E+05	1.18E+05	1.99E+05	0.89	6.52E-01	5.41E-01	1.10	7.09E-01	5.69E-01	7.63E+04	8.36E+04
1.97E+05	2.73E+05	4.01E+05	4.79E+05	3.82E+05	3.90E+05	0.85	7.74E-01	4.98E-01	1.10	7.83E-01	6.08E-01	2.34E+05	2.57E+05
8.53E+05	1.65E+06	1.74E+06	2.25E+06	2.25E+06	2.73E+06	0.85	6.35E-01	3.80E-01	1.10	5.90E-01	4.95E-01	1.29E+06	1.42E+06
5.55E+04	1.10E+05	1.08E+05	1.43E+05	2.26E+05	1.31E+05	0.86	7.65E-01	5.05E-01	1.10	7.67E-01	6.00E-01	8.55E+04	9.37E+04
1.22E+05	1.76E+05	1.75E+05	2.94E+05	2.87E+05	1.83E+05	0.87	5.66E-01	3.76E-01	1.09	5.24E-01	4.54E-01	1.30E+05	1.42E+05
6.71E+04	6.97E+04	8.49E+04	9.54E+04	1.37E+05	8.38E+04	0.83	1.04E+00	5.60E-01	1.09	1.18E+00	7.38E-01	6.04E+04	6.60E+04
7.81E+04	1.11E+05	1.23E+05	1.22E+05	1.33E+05	8.49E+04	0.81	8.36E-01	4.99E-01	1.09	9.81E-01	7.08E-01	7.81E+04	8.54E+04
7.54E+04	8.12E+04	7.94E+04	1.52E+05	1.30E+05	1.19E+05	0.85	8.45E-01	5.39E-01	1.09	9.11E-01	6.78E-01	7.54E+04	8.24E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568918452	Adipocyte plasma membrane-associated protein	1	AGPNGTLFVVDAYK	Deamidated(4)	3.49	2	726.9
32484983	Ephrin type-A receptor 2	1	TSVTVSDLEPHMNYTFAVEAR	Deamidated(13)Oxidation(12)	4.89	3	795.4
153791389	Integrin alpha-1	13	VVYVAVNQTR	Deamidated(7)	2.82	2	607.3
755537649	Platelet endothelial cell adhesion molecule	8	EETVLSQYQNFSK	Deamidated(10)	4.15	2	787.4
6680502	Integral membrane protein 2B	1	CYVIPLNTSIVMPPK	Carbamidomethyl(1)Deamidated(7)Oxidation(12)	2.79	2	875.0
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	SLTQGSILVGNLAPVNGTSQ GK	Deamidated(16)	4.63	3	715.1
117320545	CD180 antigen	2	VLNLSHSLDISSEQLFDGLPALQHLNLQGNHFPK	Deamidated(3)	4.3	4	974.8
755532856	Laminin, alpha 2	17	KADILDVVGILYVGGLPINYTTR	Deamidated(19)	6.31	3	831.1
568915917	Tyrosine-protein phosphatase non-receptor type substrate 1	5	GIANLSNFIR	Deamidated(4)	2.71	2	553.3
20137008	Biglycan	2	LLQVVYLHSHNNITK	Deamidated(11)	3.71	3	548.3
67514549	Beta-N-acetylhexosaminidase	1	SAEGTFFINK	Deamidated(9)	2.67	2	557.8
569003077	Cadherin-2	6	FLEAGIYEVPIITDSGNPPKSNISILR	Deamidated(23)	6.58	3	1019.9
755529709	Sodium/potassium-transporting ATPase subunit	2	LVEDLESFLKPYSVEEQKNLTSCPDGAPFIQHGPDYR	Carbamidomethyl(23)Deamidated(19)	8.12	4	1070.8
153791389	Integrin alpha-1	13	LDLPVNTSIPNVTEIK	Deamidated(6)	3.57	2	877.5
254281189	Tetraspanin 3	1	TYNGTNSDAASR	Deamidated(3)	2.69	2	629.3
9845246	Cathepsin F	1	VYINDSVLSR	Deamidated(4)	3.1	2	648.3
20330802	Serotransferrin	2	FDEFFSQGCAPGYEKNSTLCDLCIGPLK	Carbamidomethyl(9)Carbamidomethyl(20)Carbamidomethyl(23)Deamidated(16)	3.87	3	1085.5
568922760	Immunoglobulin superfamily member 10	6	LDIVSRPPLINGLYANK	Deamidated(11)Deamidated(16)	5.06	3	629.0
31543108	Lysosome-associated membrane glycoprotein 2	4	VPFIFNINPATTNFTGSCQPQSAQLR	Carbamidomethyl(18)Deamidated(13)	6.88	3	970.5
568939694	Serum paraoxonase/arylesterase 2	2	IQNILSEKPSVTTVYINNGSVLQGSSVATIYDR	Deamidated(17)	4.63	4	892.7
568978764	Ectonucleoside triphosphate diphosphohydrolase 5	1	GYLTSFEMFNSTFK	Deamidated(10)Oxidation(8)	3.74	2	844.9
170172530	Immunoglobulin joining chain	2	IVVPLNNRENISDPTSPLR	Deamidated(10)	3.3	3	712.4
19527130	EMILIN-1	7	RLGALNNSLLLEDR	Deamidated(6)	4.89	3	566.7
31542814	Fibroleukin	3	VANLTVVVNSLDGK	Deamidated(3)	4.2	2	715.4
110347469	Alpha-2-macroglobulin	5	LTNQTLGFSAFEQDIPVK	Deamidated(3)	5.27	3	703.4
755530199	Integrin alpha-11	3	YIASDPDDKHFFNVTDAAALK	Deamidated(13)	5.14	4	600.0
568987201	Zinc transporter ZIP14	2	YGKNDSLTLTQLK	Deamidated(4)	4.14	3	494.6
114326497	Laminin subunit beta-1	6	VNASTTDPNSTVEQSALTR	Deamidated(2)	6.34	2	996.5
153791270	Laminin subunit gamma-1	12	RVNDNKTAEEALR	Deamidated(3)Deamidated(5)	4.15	3	529.9

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1452.7	47.0	25	1.77E+06	1.65E+06	2.32E+06	1.02E+06	2.95E+06	2.79E+06	1.13E+06	1.70E+06	1.20E+06	1.07E+06	1.89E+06
2384.1	42.5	3	1.08E+05	7.70E+04	1.21E+05	4.62E+04	1.44E+05	1.32E+05	2.02E+04	5.53E+04	3.41E+04	2.79E+04	1.44E+05
1213.6	31.2	15	9.01E+05	1.05E+06	1.26E+06	5.37E+05	1.65E+06	1.52E+06	7.37E+05	7.53E+05	6.76E+05	4.75E+05	8.55E+05
1573.7	40.4	28	9.81E+05	9.46E+05	1.23E+06	6.24E+05	2.01E+06	1.72E+06	1.02E+06	1.00E+06	7.06E+05	6.06E+05	1.30E+06
1748.9	51.3	1	1.40E+05	1.58E+05	2.80E+05	8.83E+04	3.10E+05	2.33E+05	1.02E+05	1.18E+05	1.00E+05	7.24E+04	2.41E+05
2143.1	47.5	156	6.58E+04	6.82E+04	7.35E+04	3.88E+04	1.37E+05	1.04E+05	3.88E+04	1.36E+05	6.34E+04	1.06E+05	9.40E+04
3896.0	64.2	13	1.62E+05	1.88E+05	5.01E+05	5.05E+04	1.52E+05	1.37E+05	1.18E+04	1.43E+05	1.30E+04	4.55E+03	8.60E+04
2491.4	68.8	20	1.97E+05	2.72E+05	6.79E+05	1.24E+05	3.26E+05	2.52E+05	2.19E+05	2.78E+05	7.06E+04	3.40E+04	7.18E+04
1105.6	50.8	44	1.47E+06	1.79E+06	2.09E+06	9.25E+05	1.74E+06	1.85E+06	9.80E+05	1.43E+06	9.42E+05	5.77E+05	1.59E+06
1642.9	38.8	354	1.09E+05	1.20E+05	2.17E+05	1.26E+05	3.45E+05	2.73E+05	1.20E+05	1.99E+05	1.27E+05	1.47E+05	1.89E+05
1114.5	37.8	11	5.55E+05	4.88E+05	9.83E+05	2.34E+05	1.45E+06	1.36E+06	5.25E+05	4.66E+05	2.83E+05	3.92E+05	6.84E+05
3057.7	61.3	20	1.60E+05	6.15E+04	2.17E+05	1.22E+05	5.89E+05	4.85E+05	1.47E+04	1.99E+05	1.23E+05	9.40E+04	1.14E+05
4280.0	53.0	20	6.69E+05	1.14E+06	1.61E+06	2.97E+05	1.33E+06	1.66E+06	1.04E+05	6.96E+05	4.84E+05	2.62E+05	1.08E+06
1754.0	54.2	30	1.94E+05	4.06E+05	4.20E+05	1.81E+05	4.65E+05	4.22E+05	1.71E+05	2.99E+05	1.94E+05	1.26E+05	3.89E+05
1257.5	16.1	1	1.02E+05	4.35E+04	9.24E+04	0.00E+00	1.76E+05	3.71E+01	7.43E+04	7.08E+04	4.98E+04	4.79E+04	9.61E+04
1295.6	36.9	14	3.32E+05	1.64E+05	3.38E+05	1.32E+05	6.11E+05	5.61E+05	7.08E+04	4.06E+05	1.53E+05	1.13E+05	5.12E+05
3254.4	53.7	5	1.24E+05	4.66E+04	2.40E+05	6.19E+04	2.61E+05	3.30E+05	3.79E+04	1.03E+05	4.14E+04	4.26E+04	1.08E+05
1885.0	47.2	15	1.93E+05	2.43E+05	3.91E+05	2.01E+05	4.55E+05	3.91E+05	7.43E+04	2.90E+05	1.22E+05	1.64E+05	2.92E+05
2909.4	59.8	91	1.34E+06	2.32E+06	3.17E+06	7.44E+05	2.99E+06	2.62E+06	5.75E+05	1.75E+06	8.72E+05	6.66E+05	2.09E+06
3567.9	52.0	24	1.11E+05	1.38E+05	1.89E+05	7.14E+04	2.55E+05	2.00E+05	3.38E+04	1.10E+05	8.26E+04	2.55E+04	1.32E+05
1688.8	53.3	17	3.08E+05	2.81E+05	4.17E+05	1.95E+05	7.03E+05	6.09E+05	9.27E+04	3.42E+05	1.69E+05	2.12E+05	3.03E+05
2135.1	40.6	20	1.94E+05	1.07E+05	9.05E+04	1.02E+05	2.56E+05	2.16E+05	9.13E+04	1.29E+05	9.53E+04	1.26E+05	1.43E+05
1698.0	49.1	45	8.88E+05	1.32E+06	1.99E+06	9.19E+05	2.13E+06	2.01E+06	3.75E+05	1.42E+06	5.32E+05	8.07E+05	1.24E+06
1429.8	50.2	27	3.39E+05	3.75E+05	6.60E+05	3.46E+05	1.07E+06	1.01E+06	2.28E+05	6.53E+05	3.66E+05	2.99E+05	5.88E+05
2108.1	57.1	38	2.64E+05	5.09E+05	7.13E+05	4.17E+05	6.51E+05	5.52E+05	7.39E+04	4.73E+05	3.70E+05	1.11E+05	7.25E+05
2397.1	40.8	18	1.05E+05	2.04E+05	2.02E+05	7.20E+04	1.39E+05	1.53E+05	5.53E+04	1.42E+05	6.90E+04	4.31E+04	1.17E+05
1481.8	32.3	1	5.41E+05	6.42E+05	9.89E+05	3.73E+05	1.07E+06	1.06E+06	2.95E+05	7.08E+05	4.50E+05	3.27E+05	8.72E+05
1992.0	30.9	132	3.02E+06	3.12E+06	5.24E+06	2.79E+06	6.78E+06	5.89E+06	3.69E+06	2.59E+06	2.18E+06	2.26E+06	3.81E+06
1587.8	21.1	16	2.75E+05	1.01E+05	2.74E+05	3.47E+02	5.18E+05	4.19E+05	1.09E+05	1.59E+05	1.01E+05	1.46E+05	1.48E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.20E+06	1.31E+06	1.49E+06	2.14E+06	1.97E+06	1.37E+06	0.85	5.41E-01	3.21E-01	1.09	4.96E-01	4.40E-01	1.06E+06	1.15E+06
3.10E+04	5.58E+04	4.84E+04	6.78E+04	9.09E+04	8.57E+04	0.84	9.31E-01	5.28E-01	1.09	1.00E+00	7.06E-01	4.56E+04	4.98E+04
6.11E+05	6.74E+05	9.73E+05	1.14E+06	1.01E+06	1.12E+06	0.85	5.73E-01	3.47E-01	1.09	5.12E-01	4.55E-01	5.78E+05	6.31E+05
7.18E+05	8.97E+05	9.57E+05	1.20E+06	1.06E+06	8.56E+05	0.83	5.38E-01	2.95E-01	1.09	4.98E-01	4.50E-01	6.49E+05	7.07E+05
1.13E+05	1.10E+05	9.00E+04	2.06E+05	1.59E+05	1.46E+05	0.84	7.54E-01	4.39E-01	1.09	7.51E-01	6.19E-01	9.57E+04	1.04E+05
7.07E+04	5.32E+04	6.75E+04	3.30E+04	4.99E+04	6.27E+04	0.83	6.75E-01	3.81E-01	1.09	1.07E+00	7.27E-01	4.84E+04	5.26E+04
3.91E+04	3.88E+04	1.18E+05	3.60E+05	2.29E+05	1.84E+05	0.88	1.65E+00	7.79E-01	1.09	1.91E+00	8.49E-01	8.38E+04	9.11E+04
1.19E+05	1.07E+05	2.84E+05	4.67E+05	4.17E+05	3.66E+05	0.87	1.19E+00	6.78E-01	1.09	1.34E+00	7.90E-01	1.51E+05	1.64E+05
9.71E+05	1.21E+06	1.01E+06	1.85E+06	1.46E+06	1.50E+06	0.86	5.35E-01	3.48E-01	1.09	5.44E-01	5.06E-01	8.58E+05	9.31E+05
1.19E+05	1.51E+05	1.02E+05	1.74E+05	1.80E+05	1.49E+05	0.83	5.45E-01	3.28E-01	1.09	5.81E-01	5.49E-01	1.05E+05	1.14E+05
4.64E+05	5.30E+05	5.20E+05	7.32E+05	6.13E+05	5.60E+05	0.80	6.67E-01	3.80E-01	1.09	6.51E-01	6.18E-01	3.86E+05	4.19E+05
1.42E+05	6.58E+04	1.31E+05	4.05E+05	4.49E+05	6.04E+04	0.83	1.44E+00	6.71E-01	1.08	1.55E+00	8.18E-01	1.20E+05	1.31E+05
4.50E+05	7.03E+05	5.99E+05	9.08E+05	1.02E+06	1.02E+06	0.85	8.86E-01	5.59E-01	1.08	9.17E-01	7.00E-01	5.05E+05	5.47E+05
2.00E+05	2.02E+05	2.34E+05	3.82E+05	2.94E+05	2.66E+05	0.86	6.41E-01	4.09E-01	1.08	6.71E-01	5.97E-01	1.77E+05	1.92E+05
4.43E+04	4.88E+04	7.71E+04	9.13E+03	6.48E+04	5.97E+04	0.83	1.04E+00	5.74E-01	1.08	1.20E+00	7.69E-01	3.93E+04	4.26E+04
1.22E+05	2.02E+05	2.42E+05	3.42E+05	2.95E+05	2.50E+05	0.84	9.49E-01	5.54E-01	1.08	1.07E+00	7.44E-01	1.75E+05	1.89E+05
8.77E+04	6.76E+04	8.86E+04	1.48E+05	1.24E+05	2.32E+05	0.81	1.07E+00	5.47E-01	1.08	1.16E+00	7.66E-01	7.47E+04	8.08E+04
1.76E+05	2.65E+05	1.22E+05	2.28E+05	2.65E+05	2.12E+05	0.82	6.29E-01	3.49E-01	1.08	6.89E-01	6.20E-01	1.49E+05	1.61E+05
1.15E+06	1.52E+06	1.21E+06	1.81E+06	1.81E+06	1.98E+06	0.84	7.28E-01	4.53E-01	1.08	7.46E-01	6.53E-01	1.04E+06	1.12E+06
9.44E+04	9.49E+04	8.20E+04	1.69E+05	1.74E+05	1.30E+05	0.85	8.25E-01	5.15E-01	1.08	8.18E-01	6.74E-01	7.52E+04	8.13E+04
1.71E+05	2.20E+05	2.63E+05	4.27E+05	3.36E+05	3.57E+05	0.83	7.28E-01	4.31E-01	1.08	6.85E-01	6.32E-01	1.95E+05	2.10E+05
3.92E+04	1.09E+05	9.20E+04	1.61E+05	6.48E+04	2.17E+05	0.84	7.64E-01	4.35E-01	1.08	8.15E-01	6.85E-01	8.16E+04	8.82E+04
1.01E+06	1.09E+06	6.95E+05	1.19E+06	1.11E+06	1.25E+06	0.82	5.74E-01	3.29E-01	1.08	6.21E-01	6.10E-01	7.28E+05	7.87E+05
2.64E+05	3.59E+05	5.28E+05	7.17E+05	5.26E+05	4.92E+05	0.84	7.36E-01	4.56E-01	1.08	7.61E-01	6.61E-01	3.22E+05	3.47E+05
3.53E+05	3.67E+05	2.48E+05	5.00E+05	2.87E+05	5.07E+05	0.87	8.01E-01	5.32E-01	1.08	9.38E-01	7.23E-01	2.63E+05	2.84E+05
5.93E+04	1.33E+05	8.60E+04	1.23E+05	1.48E+05	1.77E+05	0.87	7.38E-01	5.20E-01	1.08	8.12E-01	6.86E-01	7.44E+04	8.02E+04
4.40E+05	4.86E+05	4.58E+05	7.99E+05	6.33E+05	5.88E+05	0.84	6.43E-01	3.90E-01	1.08	6.57E-01	6.21E-01	3.94E+05	4.24E+05
2.76E+06	2.76E+06	2.62E+06	4.55E+06	3.32E+06	3.37E+06	0.81	5.27E-01	2.44E-01	1.08	4.35E-01	4.63E-01	2.20E+06	2.37E+06
1.62E+05	1.12E+05	1.52E+05	3.35E+05	2.20E+05	1.07E+05	0.79	9.56E-01	4.84E-01	1.08	1.05E+00	7.59E-01	1.20E+05	1.29E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
755532856	Laminin, alpha 2	17	AVQLNETLGNQDKTAER	Deamidated(5)Deamidated(10)	5.99	3	630.0
21312312	Deoxyribonuclease-1-like 1	1	SYSFLNSSLLGR	Deamidated(6)	2.98	2	672.8
30089697	ADAMTS-like protein 4	2	LVSGNLTDNR	Deamidated(5)	2.41	2	488.3
46560582	EGF-receptor	1	DTLSINATNIK	Deamidated(6)	2.74	2	595.8
133778978	Cation-independent mannose-6-phosphate receptor	12	DPSSGFVFNLSPLNDSAQGHVVLGI GK	Deamidated(14)	8.44	3	919.5
568948081	Reticulocalbin-3	2	NATYGHYEPGEEFHDVEDAETYK	Deamidated(1)	5.58	4	676.3
31981509	Metalloreductase STEAP4	1	LRNATITQALTNK	Deamidated(3)	4.48	3	482.3
153791270	Laminin subunit gamma-1	12	TLAGENQTALIEELNRK	Deamidated(6)	5.79	3	677.4
568920137	Laminin subunit alpha-5	15	LNASIADLQSK	Deamidated(2)	3.63	2	580.8
568962774	Hyaluronidase-2	2	ATPNEGFFNQNITTFYYDR	Deamidated(11)	4.11	2	1150.0
161016843	Desmoglein-2	4	YVQNGTYTAK	Deamidated(4)	2.59	2	573.3
27370240	Leucyl-cystinyl aminopeptidase	8	EETLLYDNATSSVADR	Deamidated(8)	4.39	2	892.9
225007621	Integrin beta-5	1	NFTALIPGTTVEILHGDSK	Deamidated(1)	4.69	3	672.0
568971816	Intercellular adhesion molecule 2	6	QFLVSNVSK	Deamidated(6)	2.66	2	511.8
103472025	Cleft lip and palate transmembrane protein 1	1	DYYPINESLASLPLR	Deamidated(6)	3.65	2	876.4
22094083	CD48 antigen	4	ITLEVFDVPKPSIEINK	Deamidated(17)	3.87	3	680.7
268370173	Peroxidasin homolog	4	HLSNATSATHEHLEGPATNDLK	Deamidated(4)	8.92	4	586.8
755500860	GPI transamidase component PIG-T	2	KTYAVYDLFDTAMINNSR	Deamidated(16)Oxidation(13)	4.94	3	713.7
89242146	Niemann Pick type C1	6	SLAQYLHSGPPVYFVLEEGYNYSSR	Deamidated(21)	6.39	3	959.8
31542814	Fibroleukin	3	LHIGNYNGTAGDALR	Deamidated(7)	4.02	3	524.9
255522953	Plasmalemma vesicle-associated protein	1	ADSLYSQVVGLSASQANLSK	Deamidated(17)	5.35	3	680.3
84042523	Lysosomal protective protein	3	LDPPCTNTTAPSNYLNNPYVR	Carbamidomethyl(5)Deamidated(7)	5.4	3	803.4
568947434	Aminopeptidase N	9	VILRPYLTPNNQGLYIFQGNSTVR	Deamidated(10)Deamidated(11)Deamidated(20)	6.53	4	691.9
568920137	Laminin subunit alpha-5	15	EALNQAVNTTR	Deamidated(8)	4.06	2	630.8
74271806	Selenoprotein P	1	LESQGYFNISYIVVNHQGPSQLK	Deamidated(8)	6.5	3	903.8
568911646	Transforming growth factor beta-2	1	LTSPPEDYPEPDEVPEVISIYNSTR	Deamidated(23)	4.13	3	982.5
282398108	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit 1	1	DEIGNVSTSHLLILDDSVEMEIRPR	Deamidated(5)Oxidation(20)	7.88	4	714.6
6754588	Lymphocyte antigen 86	2	GSSILNYSYPLCEEDQPK	Carbamidomethyl(12)Deamidated(6)	4.63	2	1051.0
114326497	Laminin subunit beta-1	6	RVNASTTDPNSTVEQSALTR	Deamidated(3)	5.41	3	716.7

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1887.9	28.4	26	1.04E+05	7.07E+04	1.25E+05	4.43E+04	1.72E+05	1.75E+05	5.01E+04	5.42E+04	4.59E+04	4.58E+04	7.66E+04
1344.7	52.0	16	1.89E+05	2.57E+05	3.34E+05	1.43E+05	3.31E+05	2.92E+05	1.85E+05	2.05E+05	1.23E+05	9.59E+04	2.22E+05
975.5	27.0	1	5.09E+05	3.68E+05	6.14E+05	3.70E+03	1.05E+06	7.84E+05	3.45E+05	4.59E+05	2.65E+05	2.94E+05	4.33E+05
1190.6	37.3	11	8.32E+05	1.14E+06	1.30E+06	4.55E+05	1.19E+06	1.05E+06	5.17E+05	7.74E+05	5.25E+05	5.22E+05	1.02E+06
2756.4	60.3	21	6.02E+05	1.11E+06	1.69E+06	5.25E+05	1.08E+06	1.09E+06	9.39E+04	9.50E+05	2.87E+05	1.16E+05	8.95E+05
2702.1	36.3	24	3.52E+05	3.59E+05	5.18E+05	1.91E+05	7.02E+05	6.76E+05	2.06E+05	3.00E+05	2.15E+05	1.58E+05	2.89E+05
1444.8	30.3	26	2.93E+05	1.97E+05	2.83E+05	2.08E+05	4.76E+05	4.47E+05	1.83E+05	3.16E+05	2.00E+05	1.50E+05	2.27E+05
2030.0	38.4	67	2.55E+06	1.67E+06	3.21E+06	1.35E+06	4.88E+06	4.56E+06	1.29E+06	1.78E+06	1.30E+06	1.55E+06	2.15E+06
1160.6	35.7	33	2.24E+06	2.16E+06	3.58E+06	1.25E+06	4.99E+06	4.86E+06	1.83E+06	2.40E+06	1.38E+06	1.76E+06	2.63E+06
2299.0	54.9	24	5.24E+04	4.86E+04	1.05E+05	3.96E+04	1.47E+05	1.32E+05	1.42E+04	7.42E+04	6.09E+04	4.38E+04	8.44E+04
1145.5	20.6	8	4.37E+05	1.84E+05	6.46E+05	8.84E+02	1.55E+06	1.33E+06	3.99E+05	5.97E+05	3.31E+05	3.41E+05	6.24E+05
1784.8	39.6	37	1.44E+06	1.49E+06	2.07E+06	8.72E+05	2.38E+06	2.27E+06	1.19E+06	1.42E+06	1.23E+06	7.84E+05	1.66E+06
2014.0	56.5	17	1.69E+05	3.26E+05	3.40E+05	9.04E+04	2.76E+05	2.88E+05	6.06E+04	2.09E+05	9.06E+04	7.15E+04	1.85E+05
1022.6	34.2	10	4.77E+05	2.80E+05	5.83E+05	2.18E+05	9.06E+05	8.19E+05	3.23E+05	3.97E+05	2.84E+05	2.95E+05	4.86E+05
1751.9	59.9	54	1.71E+05	1.68E+05	3.29E+05	1.76E+05	4.58E+05	4.24E+05	9.37E+04	3.58E+05	1.07E+05	1.37E+05	2.84E+05
2040.1	50.9	5	6.48E+04	1.16E+05	1.33E+05	4.55E+04	1.12E+05	1.03E+05	3.52E+04	1.11E+05	4.17E+04	2.30E+04	1.01E+05
2344.1	25.3	23	1.82E+05	1.81E+05	2.34E+05	6.58E+03	3.30E+05	2.76E+05	9.25E+04	1.43E+05	6.09E+04	8.60E+04	1.43E+05
2139.0	47.9	18	2.15E+05	2.72E+05	4.39E+05	1.64E+05	4.21E+05	3.52E+05	9.62E+04	2.40E+05	1.25E+05	1.66E+05	2.20E+05
2877.4	57.8	8	1.59E+05	1.96E+05	2.82E+05	4.98E+04	1.93E+05	1.57E+05	2.98E+04	1.35E+05	4.59E+04	1.82E+04	1.02E+05
1572.8	32.9	20	2.00E+05	2.20E+05	3.89E+05	1.74E+05	5.99E+05	6.07E+05	2.75E+05	3.09E+05	2.14E+05	1.94E+05	2.67E+05
2039.0	49.4	35	4.34E+05	2.81E+05	4.20E+05	2.98E+05	7.00E+05	5.62E+05	1.69E+05	4.73E+05	2.88E+05	1.97E+05	4.10E+05
2408.1	44.2	25	2.96E+05	3.64E+05	2.76E+05	1.81E+05	5.51E+05	4.66E+05	2.91E+05	2.05E+05	4.85E+05	2.16E+05	2.35E+05
2764.5	50.6	97	6.28E+05	1.33E+06	1.81E+06	5.02E+05	1.08E+06	1.02E+06	3.45E+05	9.91E+05	5.89E+05	2.77E+05	8.53E+05
1260.6	35.1	30	2.30E+06	1.53E+06	2.87E+06	5.94E+04	4.65E+06	3.88E+06	1.86E+06	1.98E+06	1.03E+06	1.32E+06	2.14E+06
2709.4	49.6	17	5.42E+05	6.49E+05	1.18E+06	5.09E+05	1.20E+06	1.19E+06	1.95E+05	7.09E+05	3.98E+05	2.47E+05	1.13E+06
2945.4	57.0	14	1.97E+05	3.48E+05	4.13E+05	1.73E+05	4.62E+05	4.24E+05	7.45E+04	2.52E+05	1.15E+05	1.77E+05	2.92E+05
2855.4	51.5	98	5.22E+06	1.04E+07	1.07E+07	3.95E+06	1.38E+07	1.20E+07	2.61E+06	1.21E+07	4.15E+06	2.40E+06	1.14E+07
2100.9	47.3	7	9.45E+04	1.03E+05	1.15E+05	4.02E+04	9.21E+04	7.35E+04	6.79E+04	6.82E+04	2.69E+04	3.14E+04	5.54E+04
2148.1	27.5	40	6.57E+05	4.22E+05	7.17E+05	4.40E+05	1.23E+06	1.03E+06	4.85E+05	3.91E+05	3.36E+05	3.62E+05	3.58E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
7.36E+04	5.10E+04	6.41E+04	1.62E+05	8.16E+04	4.69E+04	0.80	8.60E-01	4.22E-01	1.08	9.09E-01	7.24E-01	5.18E+04	5.58E+04
1.52E+05	1.70E+05	1.62E+05	2.94E+05	2.33E+05	2.05E+05	0.84	5.50E-01	2.88E-01	1.08	5.00E-01	5.27E-01	1.31E+05	1.41E+05
2.83E+05	3.41E+05	3.63E+05	5.89E+05	5.43E+05	3.64E+05	0.82	7.41E-01	4.40E-01	1.08	7.02E-01	6.72E-01	2.76E+05	2.97E+05
6.65E+05	6.58E+05	5.87E+05	7.39E+05	7.34E+05	8.45E+05	0.83	4.87E-01	2.52E-01	1.08	5.21E-01	5.54E-01	5.01E+05	5.39E+05
4.22E+05	4.90E+05	5.64E+05	1.21E+06	1.08E+06	9.02E+05	0.86	9.66E-01	5.96E-01	1.07	1.06E+00	7.67E-01	4.70E+05	5.05E+05
2.19E+05	3.31E+05	3.01E+05	4.90E+05	4.28E+05	3.68E+05	0.83	6.90E-01	3.87E-01	1.07	6.38E-01	6.26E-01	2.20E+05	2.37E+05
1.58E+05	2.73E+05	2.89E+05	2.93E+05	2.76E+05	2.64E+05	0.83	5.13E-01	2.71E-01	1.07	5.47E-01	5.74E-01	1.67E+05	1.80E+05
1.71E+06	1.77E+06	1.77E+06	3.16E+06	2.21E+06	1.71E+06	0.80	6.55E-01	3.39E-01	1.07	6.40E-01	6.39E-01	1.40E+06	1.50E+06
1.70E+06	2.13E+06	1.92E+06	3.13E+06	2.49E+06	1.97E+06	0.81	5.94E-01	3.16E-01	1.07	5.66E-01	6.04E-01	1.54E+06	1.66E+06
3.85E+04	5.15E+04	6.25E+04	9.53E+04	7.91E+04	4.60E+04	0.84	7.78E-01	4.74E-01	1.07	8.16E-01	7.11E-01	4.32E+04	4.64E+04
3.36E+05	3.81E+05	5.84E+05	6.35E+05	6.30E+05	3.53E+05	0.80	9.09E-01	5.08E-01	1.07	9.91E-01	7.73E-01	3.37E+05	3.62E+05
9.21E+05	1.15E+06	1.37E+06	1.73E+06	1.75E+06	1.44E+06	0.85	5.09E-01	2.78E-01	1.07	4.76E-01	5.36E-01	9.29E+05	9.95E+05
9.12E+04	1.64E+05	1.23E+05	3.14E+05	3.01E+05	1.61E+05	0.86	8.86E-01	5.50E-01	1.07	9.45E-01	7.53E-01	1.18E+05	1.27E+05
2.96E+05	3.08E+05	4.44E+05	4.97E+05	4.96E+05	2.49E+05	0.81	6.40E-01	3.26E-01	1.07	6.51E-01	6.51E-01	2.69E+05	2.88E+05
2.05E+05	2.16E+05	1.73E+05	1.69E+05	1.42E+05	3.18E+05	0.81	7.01E-01	3.69E-01	1.07	8.32E-01	7.27E-01	1.44E+05	1.54E+05
3.57E+04	7.00E+04	4.78E+04	1.19E+05	9.39E+04	9.94E+04	0.87	8.00E-01	5.46E-01	1.07	8.88E-01	7.41E-01	4.94E+04	5.28E+04
1.27E+05	1.46E+05	1.00E+05	1.62E+05	1.46E+05	1.61E+05	0.80	6.64E-01	3.78E-01	1.07	6.82E-01	6.98E-01	9.34E+04	9.99E+04
1.68E+05	1.84E+05	1.99E+05	2.78E+05	2.56E+05	2.09E+05	0.81	5.46E-01	2.94E-01	1.07	5.09E-01	6.15E-01	1.46E+05	1.57E+05
8.32E+04	1.13E+05	7.71E+04	2.07E+05	1.85E+05	1.57E+05	0.85	9.62E-01	5.69E-01	1.07	1.05E+00	7.85E-01	7.87E+04	8.41E+04
1.32E+05	2.14E+05	3.23E+05	3.82E+05	3.36E+05	3.42E+05	0.83	6.76E-01	3.78E-01	1.07	6.56E-01	6.69E-01	1.89E+05	2.01E+05
2.55E+05	2.99E+05	3.50E+05	4.25E+05	4.11E+05	3.52E+05	0.84	5.42E-01	3.10E-01	1.07	5.44E-01	6.24E-01	2.34E+05	2.50E+05
2.35E+05	4.24E+05	2.50E+05	3.98E+05	3.41E+05	2.98E+05	0.87	5.55E-01	3.86E-01	1.07	8.40E-01	7.48E-01	2.11E+05	2.25E+05
4.37E+05	8.33E+05	5.61E+05	1.34E+06	1.18E+06	9.40E+05	0.87	8.27E-01	5.56E-01	1.07	8.81E-01	7.55E-01	5.42E+05	5.77E+05
1.44E+06	1.67E+06	1.66E+06	2.57E+06	1.75E+06	1.73E+06	0.80	6.77E-01	3.74E-01	1.07	6.82E-01	7.11E-01	1.25E+06	1.33E+06
4.90E+05	4.47E+05	4.92E+05	7.75E+05	6.38E+05	5.91E+05	0.82	7.82E-01	4.19E-01	1.07	8.44E-01	7.48E-01	4.15E+05	4.42E+05
2.30E+05	2.17E+05	1.65E+05	2.35E+05	2.46E+05	1.76E+05	0.79	5.75E-01	2.90E-01	1.06	6.76E-01	6.99E-01	1.54E+05	1.64E+05
4.76E+06	6.71E+06	5.22E+06	7.78E+06	9.43E+06	9.16E+06	0.85	7.89E-01	5.01E-01	1.06	8.87E-01	7.62E-01	4.84E+06	5.16E+06
3.84E+04	8.72E+04	5.71E+04	5.97E+04	9.12E+04	7.89E+04	0.82	6.03E-01	3.00E-01	1.06	6.72E-01	6.88E-01	4.32E+04	4.60E+04
4.00E+05	4.89E+05	4.51E+05	9.31E+05	6.31E+05	4.10E+05	0.80	6.94E-01	3.14E-01	1.06	6.60E-01	6.87E-01	3.52E+05	3.74E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568945078	Phospholipase D3	1	SFLLSLAALHDNHTHSDIQVK	Deamidated(12)	3.33	4	587.6
339895744	Collagen alpha-3(VI) chain	5	VAVVQQSTYESVDNASVPPVK	Deamidated(14)	4.9	3	740.0
755500366	Signal peptide peptidase-like 2A	1	IAQEGGAAALLIANNVLPSSR	Deamidated(14)	6.62	3	756.1
22094083	CD48 antigen	4	KSPGYVLDLIVTPQNK	Deamidated(15)	4.1	3	591.7
568988914	Transmembrane protein TM9SF1	1	IIFANVSVR	Deamidated(5)	2.43	2	510.3
165377206	Translocon-associated protein subunit alpha	2	DLNGNVFQDAVFNQTVTVIER	Deamidated(13)	4.66	3	794.1
236466498	UDP-glucose:glycoprotein glucosyltransferase 1	1	GTEVNATVIGESDPIDEVQGFLFGK	Deamidated(5)	5.09	2	1312.1
6680856	Corticosteroid-binding	2	DLFTNQSDFADTTK	Deamidated(5)	4.05	2	802.4
568924797	Latrophilin-2	1	SLGQFLSTENATIK	Deamidated(10)	2.8	2	755.4
133778978	Cation-independent mannose-6-phosphate receptor	12	TQGCAVTDEQLLYSFNLTSLSTSTFK	Carbamidomethyl(4)Deamidated(16)	6.19	3	971.5
6755482	Beta-sarcoglycan	2	ITSNATSDLNIK	Deamidated(4)	3.53	2	639.3
226693367	Lysosomal alpha-glucosidase	2	GVFITNETGQPLIGK	Deamidated(6)	3.41	2	787.9
27370240	Leucyl-cystinyl aminopeptidase	8	KDSLNSSHPISSSVQSSEQIEEMFDSLSYFK	Deamidated(5)Oxidation(23)	8.45	4	881.7
568959819	Collagen 5 alpha-3	1	AQPANQSVLLSIYDEK	Deamidated(5)	4.23	2	889.0
27370240	Leucyl-cystinyl aminopeptidase	8	DSLNSSHPISSSVQSSEQIEEMFDSLSYFK	Deamidated(4)Oxidation(22)	8.23	3	1132.5
8850219	Haptoglobin	2	NLFLNHSETASAK	Deamidated(5)	3.88	3	478.2
575771903	Inter alpha-trypsin inhibitor, heavy chain 4	5	VSGQMhMQNITFQTEASVAQQEK	Deamidated(9)Oxidation(5)Oxidation(7)	7.38	3	875.7
755542065	Phospholipase D4	1	ELGAIYNCSNLAQDLEK	Carbamidomethyl(9)Deamidated(8)	4.57	2	1026.5
568929104	Podocan	1	LSSLEYLDLSSNNLSR	Deamidated(13)	3.81	2	906.5
89242146	Niemann Pick type C1	6	NYKNPNLTISFTAER	Deamidated(6)	3.5	3	590.3
568962774	Hyaluronidase-2	2	RNPSANTFLHLNASSFR	Deamidated(12)	4.81	3	645.0
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	GVNVTMPSQPGVPLSSTQLQIDPALQEFQLVDLSR	Deamidated(3)Oxidation(6)	4.17	3	1293.3
227908803	Nodal modulator 1	2	VTNSNANAAGPLIVAGYNVSGSVR	Deamidated(18)	6.67	3	778.1
755541228	Synaptophysin-like protein	2	GVNKNQTVTATFGYPFR	Deamidated(6)	4.89	3	667.3
225007625	Interleukin-6 receptor subunit beta	3	EQTVINR	Deamidated(7)	2.52	2	480.3
568935338	Iduronidase	2	VIAQHQNLLFANSSSSMR	Deamidated(12)Oxidation(17)	3.32	3	674.0
227330580	Platelet receptor Gi24 isoform 1	2	HGLELASDHHGNFSITLR	Deamidated(12)	5.42	4	502.0
568940864	Inositol 1,4,5-trisphosphate receptor type 1	1	VETGENCTSPAPK	Carbamidomethyl(7)Deamidated(6)	3.43	2	695.8

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2347.2	41.6	4	1.04E+05	1.58E+05	1.95E+05	5.86E+04	1.72E+05	1.74E+05	4.33E+04	1.03E+05	7.54E+04	4.91E+04	1.50E+05
2218.1	38.2	230	5.03E+06	3.84E+06	8.03E+06	4.97E+06	1.24E+07	1.19E+07	3.09E+06	6.83E+06	3.04E+06	3.90E+06	6.51E+06
2266.2	56.6	65	6.27E+05	7.36E+05	9.84E+05	3.93E+05	1.24E+06	9.37E+05	2.39E+05	7.35E+05	3.92E+05	2.90E+05	7.59E+05
1773.0	45.8	20	6.89E+05	7.93E+05	1.12E+06	3.36E+05	8.55E+05	8.85E+05	3.75E+05	6.22E+05	3.45E+05	2.45E+05	7.04E+05
1019.6	41.0	1	4.68E+05	6.08E+05	1.04E+06	3.44E+05	9.40E+05	9.06E+05	3.07E+05	5.52E+05	2.95E+05	2.06E+05	7.03E+05
2380.2	64.4	377	5.96E+05	9.79E+05	4.93E+05	3.93E+05	1.17E+06	1.08E+06	1.14E+05	9.15E+05	4.03E+05	2.00E+05	8.91E+05
2623.3	71.1	32	9.67E+04	2.36E+05	2.67E+05	1.22E+05	3.04E+05	2.51E+05	4.11E+03	1.91E+05	4.88E+04	1.58E+04	7.83E+04
1603.7	45.3	14	1.16E+05	1.42E+05	9.36E+04	8.01E+04	2.60E+05	2.78E+05	9.23E+04	9.45E+04	9.22E+04	4.21E+04	9.95E+04
1509.8	45.0	7	1.21E+05	8.31E+04	1.50E+05	2.73E+04	1.99E+05	2.33E+05	5.62E+04	9.03E+04	6.85E+04	5.14E+04	1.16E+05
2912.4	64.3	17	6.51E+05	1.12E+06	1.89E+06	6.54E+05	1.83E+06	1.95E+06	1.68E+05	1.19E+06	3.98E+05	4.51E+05	1.45E+06
1277.7	30.7	48	2.08E+05	1.73E+05	3.12E+05	6.72E+04	4.92E+05	3.13E+05	1.98E+05	2.35E+05	1.50E+05	1.42E+05	2.67E+05
1574.8	45.6	16	3.57E+05	2.81E+05	3.78E+05	1.61E+05	5.41E+05	4.96E+05	1.56E+05	2.92E+05	2.09E+05	2.04E+05	2.57E+05
3523.6	50.7	21	5.43E+05	5.30E+05	8.13E+05	2.24E+05	1.00E+06	1.11E+06	1.18E+05	6.38E+05	3.19E+05	2.83E+05	6.69E+05
1776.9	47.1	16	2.83E+05	2.96E+05	5.68E+05	3.31E+05	6.97E+05	7.34E+05	2.37E+05	3.64E+05	1.86E+05	2.84E+05	4.39E+05
3395.5	56.8	34	4.88E+05	6.15E+05	1.07E+06	2.97E+05	1.10E+06	9.46E+05	1.55E+05	6.85E+05	4.24E+05	2.51E+05	7.37E+05
1432.7	29.5	35	1.48E+06	1.70E+06	2.76E+06	1.02E+06	3.98E+06	3.33E+06	1.80E+06	1.67E+06	1.23E+06	1.19E+06	1.97E+06
2625.2	30.5	130	3.74E+06	6.83E+06	8.82E+06	4.55E+06	1.12E+07	1.01E+07	4.81E+06	3.68E+06	6.02E+06	3.95E+06	5.46E+06
2052.0	53.4	17	1.23E+05	1.08E+05	1.75E+05	3.84E+04	2.23E+05	1.66E+05	3.43E+04	9.16E+04	5.74E+04	3.85E+04	1.88E+05
1811.9	49.9	10	6.95E+04	7.64E+04	1.16E+05	5.41E+04	1.49E+05	1.35E+05	6.93E+04	1.33E+05	4.34E+04	4.09E+04	8.54E+04
1768.9	37.6	12	1.38E+05	1.80E+05	1.91E+05	1.03E+05	2.57E+05	2.10E+05	5.13E+04	1.77E+05	7.64E+04	5.84E+04	1.52E+05
1933.0	37.1	14	1.35E+05	1.07E+05	2.28E+05	7.02E+04	3.05E+05	2.48E+05	6.35E+04	1.19E+05	9.47E+04	8.61E+04	1.68E+05
3878.0	66.2	154	5.17E+06	8.07E+06	1.56E+07	3.42E+06	1.56E+07	1.39E+07	9.28E+05	8.91E+06	4.20E+06	2.78E+06	1.09E+07
2332.2	47.1	47	3.05E+05	2.76E+05	3.58E+05	1.88E+05	7.13E+05	6.03E+05	9.35E+04	4.01E+05	1.78E+05	2.20E+05	3.56E+05
2000.0	41.4	52	6.02E+06	5.25E+06	9.02E+06	4.27E+06	9.72E+06	8.93E+06	3.23E+06	5.55E+06	3.69E+06	3.10E+06	6.57E+06
959.5	25.8	6	1.33E+05	1.31E+05	1.61E+05	2.74E+03	2.26E+05	1.65E+05	1.10E+05	1.15E+05	5.81E+04	4.74E+04	9.83E+04
2020.0	33.0	10	1.31E+05	1.25E+05	1.95E+05	8.75E+04	2.83E+05	2.87E+05	1.18E+05	1.52E+05	9.21E+04	1.06E+05	1.62E+05
2005.0	36.2	2	1.92E+05	2.59E+05	3.47E+05	1.31E+05	2.71E+05	2.33E+05	4.58E+04	2.60E+05	1.38E+05	3.99E+04	3.44E+05
1390.6	17.8	5	7.83E+04	1.00E+05	1.50E+05	0.00E+00	2.07E+05	4.26E+01	1.01E+05	1.09E+05	2.89E+04	2.67E+04	7.19E+04

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Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
7.76E+04	9.11E+04	6.36E+04	1.29E+05	1.08E+05	1.38E+05	0.84	6.93E-01	4.05E-01	1.06	7.11E-01	7.17E-01	6.95E+04	7.38E+04
3.73E+06	4.14E+06	4.57E+06	6.34E+06	6.32E+06	6.72E+06	0.80	6.34E-01	3.35E-01	1.06	5.71E-01	6.86E-01	3.67E+06	3.90E+06
4.83E+05	5.05E+05	4.82E+05	8.04E+05	6.70E+05	6.17E+05	0.82	6.25E-01	3.41E-01	1.06	6.17E-01	6.88E-01	4.00E+05	4.25E+05
3.51E+05	5.95E+05	4.05E+05	7.80E+05	7.40E+05	6.58E+05	0.84	6.43E-01	3.61E-01	1.06	6.40E-01	6.96E-01	3.85E+05	4.08E+05
3.53E+05	4.09E+05	4.57E+05	6.42E+05	5.25E+05	6.88E+05	0.82	6.80E-01	3.60E-01	1.06	6.71E-01	7.12E-01	3.43E+05	3.64E+05
4.58E+05	4.97E+05	3.86E+05	6.92E+05	7.82E+05	7.66E+05	0.86	8.03E-01	5.16E-01	1.06	8.79E-01	7.79E-01	4.00E+05	4.24E+05
6.15E+04	8.86E+04	1.58E+05	2.83E+05	1.90E+05	2.67E+05	0.84	1.11E+00	6.03E-01	1.06	1.24E+00	8.45E-01	9.50E+04	1.01E+05
5.12E+04	1.26E+05	1.12E+05	1.63E+05	1.04E+05	2.21E+05	0.83	8.72E-01	4.76E-01	1.06	8.75E-01	7.91E-01	7.87E+04	8.31E+04
6.49E+04	5.88E+04	1.08E+05	1.14E+05	1.45E+05	8.61E+04	0.81	7.73E-01	4.19E-01	1.06	7.73E-01	7.66E-01	6.46E+04	6.82E+04
6.62E+05	8.27E+05	4.91E+05	1.21E+06	1.17E+06	8.32E+05	0.81	8.28E-01	4.36E-01	1.06	9.04E-01	7.98E-01	6.15E+05	6.49E+05
1.51E+05	1.46E+05	2.09E+05	2.22E+05	2.23E+05	1.82E+05	0.81	6.01E-01	3.15E-01	1.06	5.97E-01	7.07E-01	1.36E+05	1.44E+05
1.86E+05	2.37E+05	1.95E+05	3.61E+05	3.09E+05	3.48E+05	0.82	5.71E-01	2.95E-01	1.06	4.99E-01	6.60E-01	1.83E+05	1.93E+05
3.32E+05	4.20E+05	4.48E+05	6.70E+05	6.07E+05	4.20E+05	0.82	7.28E-01	4.07E-01	1.06	7.48E-01	7.66E-01	3.36E+05	3.55E+05
3.63E+05	2.32E+05	2.71E+05	4.07E+05	2.82E+05	2.71E+05	0.78	5.64E-01	2.31E-01	1.05	6.45E-01	7.23E-01	2.29E+05	2.42E+05
4.12E+05	4.48E+05	5.27E+05	6.85E+05	6.66E+05	5.22E+05	0.83	6.88E-01	3.97E-01	1.05	7.11E-01	7.54E-01	3.71E+05	3.91E+05
1.32E+06	1.53E+06	1.41E+06	2.49E+06	1.92E+06	1.67E+06	0.80	5.86E-01	2.81E-01	1.05	5.16E-01	6.72E-01	1.19E+06	1.25E+06
6.22E+06	3.18E+06	5.15E+06	7.35E+06	4.41E+06	7.44E+06	0.81	5.77E-01	2.72E-01	1.05	6.63E-01	7.36E-01	3.84E+06	4.05E+06
5.50E+04	8.91E+04	6.10E+04	9.84E+04	9.39E+04	1.09E+05	0.81	8.75E-01	4.43E-01	1.05	9.41E-01	8.17E-01	6.36E+04	6.69E+04
6.99E+04	9.89E+04	3.98E+04	7.70E+04	1.37E+05	6.98E+04	0.82	6.79E-01	3.48E-01	1.05	7.74E-01	7.77E-01	5.41E+04	5.69E+04
9.81E+04	8.00E+04	8.92E+04	2.04E+05	1.97E+05	1.51E+05	0.84	7.21E-01	4.09E-01	1.05	7.20E-01	7.61E-01	8.83E+04	9.29E+04
8.09E+04	1.02E+05	1.08E+05	1.74E+05	1.48E+05	1.06E+05	0.80	6.91E-01	3.49E-01	1.05	6.69E-01	7.73E-01	8.58E+04	8.99E+04
4.66E+06	5.63E+06	4.83E+06	1.05E+07	8.28E+06	7.38E+06	0.82	8.78E-01	4.75E-01	1.05	9.30E-01	8.34E-01	4.77E+06	4.99E+06
2.12E+05	2.01E+05	2.36E+05	3.34E+05	3.59E+05	2.98E+05	0.80	6.61E-01	3.56E-01	1.05	6.40E-01	7.87E-01	1.96E+05	2.05E+05
3.99E+06	4.05E+06	4.71E+06	6.67E+06	6.13E+06	4.64E+06	0.81	5.33E-01	2.25E-01	1.05	4.90E-01	7.01E-01	3.53E+06	3.69E+06
6.33E+04	7.74E+04	1.06E+05	1.54E+05	1.36E+05	1.15E+05	0.81	7.21E-01	3.78E-01	1.04	6.97E-01	7.92E-01	6.96E+04	7.27E+04
7.42E+04	1.02E+05	1.33E+05	1.88E+05	1.35E+05	1.42E+05	0.80	5.91E-01	2.67E-01	1.04	5.67E-01	7.49E-01	9.26E+04	9.67E+04
1.19E+05	1.19E+05	1.18E+05	2.71E+05	2.08E+05	2.10E+05	0.86	8.47E-01	5.28E-01	1.04	9.68E-01	8.54E-01	1.23E+05	1.28E+05
4.41E+04	6.17E+04	7.60E+04	9.63E+04	9.01E+04	9.51E+04	0.82	9.42E-01	5.33E-01	1.04	9.90E-01	8.66E-01	4.90E+04	5.11E+04

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Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568942448	Nuclear pore membrane glycoprotein 210	3	IEAVLPAEFFEVLSQQNGSYHHIR	Deamidated(18)	8.86	4	708.6
568942448	Nuclear pore membrane glycoprotein 210	3	GLMVGNGSVLGVVQAVDAETGK	Deamidated(6)Oxidation(3)	5.1	3	706.7
569018891	Angiopoietin-related protein 7	2	LFLGNYSGNVGK	Deamidated(5)	2.82	2	635.3
45429999	Toll-like receptor 13	3	ITNLTEAISDIPR	Deamidated(3)	3.66	2	722.4
86439989	Olfactomedin-like protein 3	1	IYVLDGTQNDTAFVFPR	Deamidated(9)	4.29	2	979.0
73661202	Coagulation factor IX	1	TIPHHQYNATINK	Deamidated(8)	3.13	3	513.3
568931034	Endothelin-converting enzyme 1	3	LLGGGDEDAIRPQMQQILDFETALANITIPQEK	Deamidated(26)Oxidation(14)	5.37	3	1214.6
225735655	prosaposin	7	LVLYLEHNLEKNSTKEEILAALEK	Deamidated(12)	5.94	4	700.4
568967234	Membralin	1	VFKPQSGADALNDSQDFPFPAK	Deamidated(12)	5.89	3	903.1
153791389	Integrin alpha-1	13	QTQVGIVQYGANVTHEFNLNK	Deamidated(12)	6.44	3	787.7
237874245	Multiple epidermal growth factor-like domains protein 8	1	ALLTNVSSVALGSR	Deamidated(5)	2.8	2	694.9
31560699	Follistatin-related protein 1	2	GSNYSEILDK	Deamidated(3)	2.63	2	563.8
160333372	Lumican	5	LGSFDGLVNLTFIYLQHNQLK	Deamidated(18)	5.82	3	807.8
569018167	Tenascin-X	2	GPNFTSPASITFTTGLKPPQDLEAK	Deamidated(3)	4.21	3	873.5
14916479	Cation-dependent mannose-6-phosphate receptor	2	EASNHSSGAGLVQINK	Deamidated(4)	4.45	3	538.3
755529709	Sodium/potassium-transporting ATPase subunit	2	EENATIATYPEFGVLDLK	Deamidated(3)	4.85	2	1006.0
568960899	Neuroplastin	4	ENGVFEEISNSSGR	Deamidated(10)	4.04	2	763.3
568935150	Ecto-ADP-ribosyltransferase	2	LGNFTLAYSAPETADNQR	Deamidated(3)	4.27	2	1049.0
20330802	Serotransferrin	2	NSTLCDLCIGPLK	Carbamidomethyl(5)Carbamidomethyl(8)Deamidated(1)	2.99	2	746.4
6755482	Beta-sarcoglycan	2	AENSIILNGTVMVSPTR	Deamidated(3)Deamidated(8)Oxidation(12)	5.04	2	910.0
568956330	Neuropilin-1	2	EGFSANYSVLQSSISEDFK	Deamidated(6)	6.24	2	1055.0
45429999	Toll-like receptor 13	3	LDLTNNSIMYLDHSPR	Deamidated(5)Oxidation(9)	3.9	3	636.0
568953122	Insulin receptor	4	HNLTITQGK	Deamidated(2)	3.24	2	506.8
226437629	Embigin	4	SNVSVEENVILEKPSHVELK	Deamidated(2)	4.14	3	751.1
568908552	Carboxypeptidase PM20D1	2	GALDLMLQVNMTPGHSSAPPK	Deamidated(10)Oxidation(6)Oxidation(11)	4.25	3	733.0
85719313	Carcinoembryonic antigen-related cell adhesion molecule 1	1	FHVHQPVTQPFLQVTNTTVK	Deamidated(16)	4.99	4	581.3
116734815	Glucosylceramidase	2	VYTYADTPNDFQLSNFSLPEEDTK	Deamidated(15)	5.57	2	1398.1
568954529	Protocadherin Fat 1	6	VNTTTVNIDVSDVNDNAPLFSR	Deamidated(2)	4.34	3	798.1
568920137	Laminin subunit alpha-5	15	LNTTGISFGCTADLLVGR	Carbamidomethyl(10)Deamidated(2)	4.96	2	948.5

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2831.4	58.0	17	2.47E+05	2.81E+05	4.75E+05	1.42E+05	6.39E+05	6.04E+05	7.37E+04	4.45E+05	1.73E+05	1.19E+05	4.46E+05
2118.1	56.4	24	8.81E+04	8.95E+04	1.39E+05	8.22E+04	2.22E+05	1.94E+05	3.97E+04	1.31E+05	4.06E+04	4.85E+04	1.00E+05
1269.6	40.4	10	7.45E+04	1.77E+05	1.75E+05	5.50E+04	1.67E+05	1.57E+05	8.78E+04	5.34E+04	2.22E+04	2.84E+04	7.92E+04
1443.8	49.7	13	1.93E+05	1.49E+05	2.19E+05	6.38E+04	1.84E+05	1.62E+05	9.62E+04	1.20E+05	9.76E+04	5.35E+04	1.42E+05
1957.0	56.5	39	4.50E+05	9.08E+05	9.31E+05	3.58E+05	1.10E+06	9.31E+05	1.86E+05	5.85E+05	3.38E+05	2.89E+05	5.66E+05
1537.8	18.7	4	2.22E+05	1.14E+05	4.14E+05	5.95E+03	5.88E+05	5.99E+05	2.18E+05	2.79E+05	1.29E+05	5.89E+04	1.61E+05
3641.8	65.8	33	1.76E+05	3.33E+05	3.78E+05	1.16E+05	3.06E+05	3.18E+05	3.45E+03	2.03E+05	1.37E+05	6.68E+04	2.00E+05
2798.5	47.4	33	8.06E+05	1.17E+06	1.80E+06	7.43E+05	2.32E+06	1.84E+06	1.43E+05	9.32E+05	2.41E+05	1.94E+05	8.96E+05
2707.3	45.1	16	4.08E+05	4.58E+05	7.64E+05	2.68E+05	7.90E+05	7.76E+05	2.30E+05	4.73E+05	3.59E+05	2.55E+05	4.71E+05
2361.2	46.5	16	3.22E+05	3.81E+05	5.44E+05	2.04E+05	4.90E+05	4.45E+05	1.58E+05	3.28E+05	1.99E+05	1.50E+05	3.12E+05
1388.8	47.1	9	9.09E+04	1.17E+05	2.03E+05	8.65E+04	2.43E+05	2.46E+05	6.29E+04	2.62E+05	1.45E+05	5.50E+04	2.99E+05
1126.5	32.9	16	4.20E+05	5.48E+05	8.04E+05	2.51E+05	1.19E+06	1.09E+06	5.09E+05	4.67E+05	2.52E+05	2.21E+05	4.55E+05
2421.3	66.2	97	1.11E+06	1.41E+06	3.43E+06	9.29E+05	2.46E+06	1.98E+06	6.74E+05	2.16E+06	5.20E+05	3.20E+05	7.33E+05
2618.3	49.7	17	2.58E+05	1.54E+05	4.41E+05	1.97E+05	6.68E+05	5.85E+05	1.22E+05	4.18E+05	1.78E+05	1.88E+05	3.34E+05
1612.8	25.9	50	2.39E+06	2.29E+06	2.58E+06	8.19E+04	2.78E+06	2.11E+06	1.97E+06	1.79E+06	1.21E+06	7.14E+05	1.71E+06
2011.0	58.4	73	1.99E+06	3.73E+06	4.06E+06	1.68E+06	4.12E+06	3.84E+06	1.12E+06	2.93E+06	2.03E+06	1.18E+06	3.07E+06
1525.7	38.1	32	3.11E+05	2.89E+05	1.71E+05	2.05E+05	4.47E+05	4.91E+05	1.84E+05	3.10E+05	1.72E+05	1.53E+05	2.73E+05
2097.0	37.2	42	1.04E+06	4.07E+05	1.90E+06	6.82E+05	3.02E+06	2.84E+06	6.53E+05	2.22E+06	1.25E+06	1.51E+06	1.75E+06
1491.7	50.2	2	1.16E+05	1.88E+05	1.98E+05	4.51E+04	3.48E+05	3.29E+05	7.71E+04	8.89E+04	1.08E+05	8.65E+04	2.61E+05
1818.9	42.5	67	1.68E+05	2.57E+05	6.38E+05	1.37E+05	6.87E+05	6.02E+05	1.45E+05	3.27E+05	1.78E+05	1.54E+05	4.94E+05
2109.0	55.7	40	3.41E+05	6.44E+05	7.22E+05	3.09E+05	8.25E+05	7.05E+05	1.91E+05	4.25E+05	3.60E+05	2.41E+05	5.55E+05
1905.9	42.0	6	2.51E+05	2.16E+05	2.42E+05	8.91E+04	3.07E+05	2.30E+05	1.45E+05	1.70E+05	1.16E+05	6.83E+04	1.55E+05
1012.5	21.0	5	1.21E+05	5.65E+04	1.72E+05	0.00E+00	2.95E+05	2.76E+05	9.58E+04	1.14E+05	7.49E+04	6.27E+04	1.11E+05
2251.2	35.8	7	1.17E+05	1.29E+05	1.99E+05	7.62E+04	1.57E+05	1.56E+05	5.15E+04	1.51E+05	1.14E+05	3.22E+04	1.18E+05
2197.1	37.2	1	3.75E+04	1.71E+05	2.62E+05	2.20E+04	1.63E+05	1.80E+05	6.04E+04	7.23E+04	6.25E+04	3.03E+04	1.98E+05
2322.2	38.3	35	2.90E+05	2.45E+05	5.45E+05	1.34E+05	7.88E+05	6.88E+05	1.47E+05	3.64E+05	2.68E+05	2.50E+05	4.17E+05
2795.3	56.6	36	3.99E+05	3.83E+05	4.46E+05	2.65E+05	4.86E+05	4.32E+05	6.95E+04	2.78E+05	1.88E+05	1.47E+05	3.29E+05
2392.2	51.5	4	8.15E+04	1.13E+05	1.28E+05	5.25E+04	1.84E+05	1.43E+05	4.06E+04	1.16E+05	3.34E+04	3.35E+04	1.10E+05
1896.0	56.7	19	1.80E+05	2.47E+05	4.35E+05	1.26E+05	6.17E+05	5.87E+05	7.50E+04	3.12E+05	1.22E+05	8.50E+04	5.13E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.67E+05	2.51E+05	2.11E+05	4.01E+05	3.57E+05	2.93E+05	0.82	8.29E-01	4.53E-01	1.04	8.85E-01	8.43E-01	1.96E+05	2.04E+05
7.14E+04	7.96E+04	8.38E+04	1.30E+05	1.29E+05	7.79E+04	0.79	6.87E-01	3.28E-01	1.04	6.92E-01	8.07E-01	6.36E+04	6.64E+04
4.33E+04	1.38E+05	5.87E+04	1.06E+05	9.47E+04	1.27E+05	0.78	8.10E-01	3.63E-01	1.04	9.84E-01	8.58E-01	5.91E+04	6.16E+04
1.44E+05	8.51E+04	9.10E+04	1.79E+05	1.06E+05	1.30E+05	0.81	5.76E-01	2.56E-01	1.04	6.62E-01	7.96E-01	8.31E+04	8.66E+04
5.13E+05	4.47E+05	3.88E+05	6.62E+05	5.96E+05	6.77E+05	0.80	6.23E-01	3.16E-01	1.04	6.27E-01	8.00E-01	3.67E+05	3.82E+05
2.63E+05	1.93E+05	1.80E+05	2.70E+05	2.00E+05	4.79E+05	0.79	1.00E+00	4.77E-01	1.04	1.10E+00	8.79E-01	1.59E+05	1.65E+05
1.47E+05	1.31E+05	1.42E+05	3.29E+05	2.27E+05	2.15E+05	0.83	8.31E-01	4.74E-01	1.04	8.82E-01	8.53E-01	1.27E+05	1.32E+05
4.83E+05	7.53E+05	6.83E+05	1.82E+06	1.13E+06	1.09E+06	0.79	9.70E-01	4.59E-01	1.04	1.06E+00	8.76E-01	6.05E+05	6.29E+05
2.85E+05	3.67E+05	3.92E+05	5.46E+05	5.46E+05	4.16E+05	0.81	5.72E-01	2.82E-01	1.04	5.33E-01	7.71E-01	2.91E+05	3.02E+05
2.53E+05	2.29E+05	2.57E+05	4.41E+05	3.44E+05	2.20E+05	0.81	5.84E-01	2.57E-01	1.04	6.01E-01	7.86E-01	1.96E+05	2.04E+05
1.06E+05	7.65E+04	1.37E+05	1.08E+05	1.88E+05	1.36E+05	0.85	8.82E-01	5.38E-01	1.04	1.09E+00	8.81E-01	9.75E+04	1.01E+05
4.09E+05	5.26E+05	3.77E+05	6.31E+05	4.91E+05	7.38E+05	0.78	6.92E-01	3.14E-01	1.04	6.67E-01	8.10E-01	3.40E+05	3.54E+05
5.33E+05	7.56E+05	7.14E+05	2.38E+06	2.98E+06	2.73E+06	0.86	1.18E+00	6.46E-01	1.04	1.26E+00	9.01E-01	9.24E+05	9.60E+05
1.71E+05	1.99E+05	1.90E+05	3.95E+05	3.84E+05	3.01E+05	0.81	7.59E-01	3.97E-01	1.04	7.52E-01	8.40E-01	1.90E+05	1.97E+05
1.12E+06	1.46E+06	1.52E+06	2.06E+06	2.11E+06	1.96E+06	0.83	6.13E-01	3.30E-01	1.04	5.96E-01	7.96E-01	1.12E+06	1.16E+06
1.91E+06	2.05E+06	2.03E+06	3.11E+06	2.90E+06	2.46E+06	0.83	5.73E-01	2.93E-01	1.04	5.97E-01	7.99E-01	1.66E+06	1.72E+06
1.64E+05	1.90E+05	2.22E+05	3.41E+05	2.67E+05	2.52E+05	0.81	5.57E-01	2.57E-01	1.04	5.33E-01	7.76E-01	1.66E+05	1.72E+05
7.35E+05	8.98E+05	1.50E+06	1.42E+06	1.55E+06	5.48E+05	0.80	7.83E-01	3.95E-01	1.04	1.00E+00	8.79E-01	9.09E+05	9.43E+05
8.69E+04	1.67E+05	6.96E+04	8.90E+04	8.76E+04	1.94E+05	0.78	9.29E-01	4.23E-01	1.04	1.04E+00	8.84E-01	9.35E+04	9.69E+04
2.22E+05	2.03E+05	2.37E+05	3.55E+05	2.57E+05	2.64E+05	0.78	8.19E-01	3.92E-01	1.04	8.94E-01	8.66E-01	1.95E+05	2.03E+05
3.86E+05	3.10E+05	3.45E+05	5.11E+05	4.39E+05	4.65E+05	0.81	5.71E-01	2.73E-01	1.04	5.88E-01	8.02E-01	2.91E+05	3.02E+05
1.76E+05	1.29E+05	1.32E+05	2.51E+05	1.79E+05	1.78E+05	0.81	5.59E-01	2.29E-01	1.04	5.77E-01	7.97E-01	1.13E+05	1.17E+05
7.11E+04	8.58E+04	1.26E+05	1.48E+05	1.36E+05	9.46E+04	0.78	8.03E-01	4.14E-01	1.04	8.32E-01	8.67E-01	7.46E+04	7.73E+04
8.64E+04	9.69E+04	7.93E+04	1.69E+05	1.35E+05	1.62E+05	0.86	6.58E-01	4.22E-01	1.04	7.41E-01	8.42E-01	7.66E+04	7.94E+04
5.86E+04	6.51E+04	6.15E+04	1.00E+05	8.54E+04	1.43E+05	0.81	1.05E+00	5.23E-01	1.03	1.19E+00	9.13E-01	6.50E+04	6.71E+04
2.96E+05	2.50E+05	2.95E+05	3.69E+05	2.82E+05	2.32E+05	0.77	6.37E-01	3.14E-01	1.03	7.26E-01	8.67E-01	2.20E+05	2.26E+05
2.21E+05	2.74E+05	1.82E+05	3.64E+05	2.71E+05	3.06E+05	0.80	5.61E-01	2.35E-01	1.03	5.63E-01	8.27E-01	1.88E+05	1.93E+05
4.52E+04	6.31E+04	8.02E+04	9.99E+04	7.52E+04	1.25E+05	0.80	7.27E-01	3.39E-01	1.03	7.68E-01	8.78E-01	5.59E+04	5.75E+04
1.59E+05	1.94E+05	1.48E+05	2.96E+05	2.32E+05	2.61E+05	0.79	9.67E-01	4.47E-01	1.03	1.08E+00	9.13E-01	1.67E+05	1.72E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568991301	Plexin B2	10	GGLNLTAVTVTAENDHTVAFLGTSD GR	Deamidated(4)	7.06	3	906.5
27734847	Junctional adhesion molecule A	1	AFMNSSFTIDPK	Deamidated(4)Oxidation(3)	3.05	2	687.8
755495449	Immunoglobulin superfamily member 8	2	GETASLLCNISVR	Carbamidomethyl(8)Deamidated(9)	3.77	2	710.9
6857783	low affinity immunoglobulin gamma Fc region receptor II-	3	YHHYSSNFSIPK	Deamidated(7)	4.36	3	494.2
157057166	Toll-like receptor 9	5	NNLVTIKPEMFVNLSR	Deamidated(13)Oxidation(10)	3.95	3	631.3
148747408	Laminin subunit alpha-4	7	IQINNSENTR	Deamidated(4)	2.75	2	651.8
568956047	Cadherin-5	1	NEDSNFTLINNHNTANITVK	Deamidated(10)Deamidated(11)Dea midated(17)	5.42	3	792.7
30424948	Transmembrane protein 62	1	NYSNGTHTIEVFVQDSAGR	Deamidated(4)	4.98	3	699.3
46849812	Fibronectin	10	NYTDCSTSEGR	Carbamidomethyl(5)Deamidated(1)	2.55	2	602.2
569018891	Angiopoietin-related protein 7	2	AQVANLSSLLGELSR	Deamidated(5)	3.72	2	779.9
18087747	Protocadherin gamma subfamily C, 3	2	ETMPEYNLSITAR	Deamidated(7)Oxidation(3)	2.7	2	771.4
568986786	Inter-alpha-trypsin inhibitor heavy chain H3	1	GDEKENITAEALDSLK	Deamidated(6)	5.21	2	924.0
568905353	Extracellular sulfatase	3	LYPNASQHITPSYNYAPNMDK	Deamidated(4)Oxidation(19)	3.59	3	814.4
225735655	prosaposin	7	NSTKEELAALEK	Deamidated(1)	3.9	2	723.9
161016843	Desmoglein-2	4	SVCEDEPYVNVTAEDLDGAQNSAP FSFSIIDQPPGTAQK	Carbamidomethyl(3)Deamidated(21)	3.86	3	1400.0
568935150	Ecto-ADP-ribosyltransferase 3	2	KGTSNDLVLQSNSTCSYYECAFLG GLK	Carbamidomethyl(16)Carbamidomet hyl(21)Deamidated(13)	5.62	3	1042.8
568922760	Immunoglobulin superfamily member 10	6	YILHENGTLVIK	Deamidated(6)	3.48	3	467.6
161484610	Ectonucleoside triphosphate diphosphohydrolase 2	1	LLNLTSPEATAK	Deamidated(3)	2.76	2	629.8
52693935	Thioredoxin domain- containing protein 15	1	IFIFNQTGIEAK	Deamidated(5)	2.87	2	691.4
165932373	Collectin-12	4	HTDDLTLNNTLVNIR	Deamidated(9)	4.95	2	914.0
6678347	Thy-1 membrane glycoprotein	3	DEGDYFCELQVSGANPMSSNK	Carbamidomethyl(7)Deamidated(20) Oxidation(17)	5.22	2	1183.0
568956867	CD97 antigen	2	ISENGSSVAGILSSPNMEK	Deamidated(4)Oxidation(17)	5.3	2	969.0
124487303	Transmembrane protein 87B	1	TMFNSTEIK	Deamidated(4)Oxidation(2)	2.55	2	544.3
568948476	ER membrane protein complex subunit 10	1	GSEVEDEDLELFNTSVQLRPPSTAP GPETAAFIER	Deamidated(13)	8.1	3	1268.3
153792704	Plexin D1	1	ISLNESMQVVSRR	Deamidated(4)Oxidation(7)	3.83	2	690.3
9625018	Glycerophosphodiester phosphodiesterase 1	1	HNLTIFFDVK	Deamidated(2)	3.64	2	617.8

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2717.3	52.7	19	3.84E+05	5.25E+05	6.25E+05	2.24E+05	7.36E+05	6.35E+05	1.21E+05	5.07E+05	2.30E+05	1.10E+05	5.33E+05
1374.6	38.9	19	1.71E+06	1.72E+06	2.47E+06	1.05E+06	3.14E+06	2.98E+06	1.67E+06	1.70E+06	1.18E+06	9.67E+05	2.00E+06
1420.7	44.1	5	1.21E+05	1.79E+05	1.85E+05	5.79E+04	1.72E+05	1.90E+05	6.91E+04	1.03E+05	7.02E+04	4.43E+04	2.18E+05
1480.7	27.5	20	1.31E+06	1.21E+06	1.48E+06	3.47E+03	1.60E+06	1.20E+06	1.16E+06	1.19E+06	7.67E+05	4.47E+05	9.02E+05
1892.0	45.6	16	2.58E+05	2.05E+05	2.77E+05	1.35E+05	2.73E+05	2.81E+05	7.33E+04	1.75E+05	8.90E+04	7.99E+04	2.27E+05
1302.7	28.0	7	1.65E+05	1.06E+05	1.83E+05	1.46E+05	2.80E+05	2.91E+05	1.45E+05	1.24E+05	8.97E+04	8.90E+04	1.48E+05
2376.1	39.6	41	1.79E+05	1.45E+05	3.34E+05	1.07E+05	4.32E+05	3.57E+05	9.94E+04	2.46E+05	1.00E+05	8.77E+04	2.12E+05
2096.0	42.6	6	1.39E+05	1.64E+05	1.92E+05	5.56E+04	2.42E+05	2.24E+05	6.17E+04	1.10E+05	1.09E+05	6.55E+04	1.79E+05
1203.5	17.7	18	1.26E+06	1.31E+06	1.90E+06	2.70E+02	2.65E+06	9.09E+03	1.04E+06	1.03E+06	2.79E+05	3.45E+05	1.18E+06
1558.8	61.3	16	6.53E+04	2.55E+05	2.41E+05	6.07E+04	1.87E+05	2.03E+05	4.28E+04	7.71E+04	3.37E+04	2.60E+04	1.13E+05
1541.7	37.3	13	5.91E+04	1.07E+05	1.24E+05	7.38E+04	1.62E+05	1.16E+05	7.83E+04	9.52E+04	5.83E+04	3.62E+04	7.77E+04
1846.9	45.4	55	1.63E+06	2.23E+06	2.97E+06	3.20E+06	4.00E+06	3.77E+06	2.26E+06	2.13E+06	4.19E+06	1.08E+06	2.42E+06
2441.1	32.8	2	9.36E+04	9.90E+04	1.11E+05	5.42E+04	1.67E+05	1.34E+05	6.91E+04	7.20E+04	5.71E+04	6.08E+04	4.98E+04
1446.8	42.0	23	5.58E+05	1.04E+06	1.05E+06	2.83E+05	1.59E+06	1.36E+06	5.25E+05	5.35E+05	2.44E+05	3.40E+05	5.73E+05
4197.9	62.3	4	3.55E+04	2.05E+04	1.28E+05	2.68E+04	2.32E+05	1.85E+05	2.27E+03	6.71E+04	3.81E+04	4.14E+04	7.24E+04
3126.5	59.4	14	7.66E+04	4.33E+04	2.03E+05	4.45E+04	2.12E+05	2.28E+05	1.97E+04	1.58E+05	8.38E+04	5.24E+04	1.33E+05
1400.8	36.1	13	1.57E+05	1.62E+05	2.96E+05	1.27E+05	3.86E+05	3.41E+05	3.85E+04	2.21E+05	8.81E+04	6.45E+04	2.19E+05
1258.7	37.8	20	1.66E+06	1.34E+06	1.74E+06	8.28E+05	1.80E+06	1.64E+06	1.44E+06	1.45E+06	9.29E+05	6.01E+05	1.33E+06
1381.7	50.2	15	2.22E+05	2.54E+05	5.03E+05	1.26E+05	6.44E+05	5.24E+05	1.07E+05	3.41E+05	1.70E+05	1.21E+05	4.21E+05
1826.9	45.3	25	5.96E+05	6.51E+05	7.29E+05	2.62E+05	8.23E+05	8.88E+05	2.86E+05	6.28E+05	3.37E+05	2.15E+05	4.68E+05
2365.0	45.9	20	1.41E+05	1.97E+05	2.06E+05	7.41E+04	2.53E+05	2.26E+05	1.42E+05	1.45E+05	6.98E+04	4.68E+04	1.39E+05
1936.9	39.1	17	3.03E+05	3.35E+05	4.54E+05	1.67E+05	5.91E+05	4.85E+05	1.87E+05	2.43E+05	2.00E+05	1.68E+05	2.45E+05
1087.5	27.4	4	2.79E+05	2.33E+05	4.03E+05	1.40E+05	5.22E+05	3.95E+05	2.80E+05	2.10E+05	1.52E+05	1.03E+05	3.14E+05
3802.8	57.2	58	8.26E+05	1.06E+06	1.77E+06	5.41E+05	2.04E+06	2.03E+06	1.42E+05	1.45E+06	6.56E+05	4.22E+05	1.48E+06
1379.7	32.3	16	1.78E+05	1.64E+05	2.58E+05	1.04E+05	2.94E+05	3.25E+05	1.37E+05	1.83E+05	1.03E+05	7.79E+04	1.92E+05
1234.6	47.7	11	7.61E+04	1.39E+05	1.82E+05	6.28E+04	1.92E+05	1.94E+05	3.14E+04	1.45E+05	4.92E+04	1.57E+04	1.47E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.49E+05	3.29E+05	2.83E+05	5.15E+05	4.29E+05	4.43E+05	0.82	7.22E-01	3.68E-01	1.03	7.63E-01	8.80E-01	2.55E+05	2.62E+05
1.16E+06	1.37E+06	1.54E+06	2.03E+06	1.77E+06	1.52E+06	0.79	4.93E-01	1.68E-01	1.03	4.36E-01	8.04E-01	1.12E+06	1.15E+06
8.08E+04	8.50E+04	7.49E+04	1.00E+05	9.39E+04	1.20E+05	0.80	7.49E-01	3.41E-01	1.03	8.45E-01	9.00E-01	7.33E+04	7.52E+04
5.44E+05	8.77E+05	7.40E+05	1.61E+06	1.03E+06	1.18E+06	0.83	6.91E-01	3.76E-01	1.03	7.10E-01	8.82E-01	6.50E+05	6.67E+05
9.17E+04	1.66E+05	1.24E+05	1.87E+05	1.69E+05	2.02E+05	0.79	6.01E-01	2.44E-01	1.03	6.06E-01	8.65E-01	1.11E+05	1.14E+05
1.06E+05	1.17E+05	1.13E+05	1.88E+05	1.40E+05	1.46E+05	0.77	5.07E-01	1.65E-01	1.02	4.07E-01	8.20E-01	9.50E+04	9.72E+04
1.13E+05	1.47E+05	2.29E+05	2.23E+05	2.23E+05	1.46E+05	0.78	6.91E-01	3.07E-01	1.02	7.47E-01	9.00E-01	1.25E+05	1.28E+05
8.59E+04	8.73E+04	8.45E+04	1.54E+05	1.56E+05	1.19E+05	0.81	6.66E-01	3.19E-01	1.02	6.62E-01	8.88E-01	8.34E+04	8.53E+04
5.49E+05	7.45E+05	6.47E+05	1.17E+06	7.74E+05	1.19E+06	0.78	9.60E-01	4.85E-01	1.02	1.03E+00	9.32E-01	5.89E+05	6.02E+05
4.90E+04	1.60E+05	6.51E+04	1.27E+05	1.43E+05	1.31E+05	0.79	9.24E-01	4.39E-01	1.02	1.13E+00	9.37E-01	7.20E+04	7.36E+04
7.47E+04	6.56E+04	6.32E+04	1.42E+05	7.33E+04	8.14E+04	0.79	5.84E-01	2.09E-01	1.02	5.91E-01	9.12E-01	5.58E+04	5.67E+04
3.43E+06	1.40E+06	2.37E+06	3.95E+06	2.26E+06	2.46E+06	0.83	5.82E-01	2.81E-01	1.01	9.40E-01	9.48E-01	1.79E+06	1.81E+06
6.06E+04	4.93E+04	1.11E+05	9.05E+04	7.77E+04	8.30E+04	0.77	5.30E-01	1.52E-01	1.01	5.80E-01	9.18E-01	5.41E+04	5.50E+04
3.45E+05	6.51E+05	3.93E+05	1.19E+06	8.36E+05	5.66E+05	0.77	8.21E-01	3.44E-01	1.01	8.59E-01	9.46E-01	4.39E+05	4.45E+05
5.02E+04	3.92E+04	5.50E+04	7.27E+04	7.54E+04	7.80E+04	0.74	9.32E-01	4.65E-01	1.01	9.88E-01	9.61E-01	4.41E+04	4.47E+04
5.03E+04	7.79E+04	1.22E+05	1.06E+05	1.65E+05	4.88E+04	0.79	9.14E-01	4.49E-01	1.01	1.03E+00	9.58E-01	6.86E+04	6.96E+04
1.03E+05	2.02E+05	9.02E+04	1.76E+05	2.26E+05	1.80E+05	0.78	7.66E-01	3.43E-01	1.01	8.15E-01	9.51E-01	1.13E+05	1.15E+05
7.05E+05	1.16E+06	9.74E+05	1.69E+06	1.17E+06	1.56E+06	0.81	4.63E-01	1.40E-01	1.01	4.57E-01	9.20E-01	8.32E+05	8.41E+05
1.86E+05	1.96E+05	2.22E+05	2.77E+05	3.01E+05	2.72E+05	0.78	7.51E-01	3.41E-01	1.01	7.84E-01	9.59E-01	1.82E+05	1.83E+05
3.05E+05	3.78E+05	4.14E+05	6.99E+05	6.46E+05	6.05E+05	0.81	6.20E-01	2.73E-01	1.01	5.99E-01	9.47E-01	3.35E+05	3.38E+05
5.54E+04	1.66E+05	1.02E+05	1.89E+05	1.93E+05	1.31E+05	0.79	6.61E-01	2.63E-01	1.01	6.76E-01	9.57E-01	9.16E+04	9.25E+04
2.64E+05	2.19E+05	2.10E+05	3.51E+05	2.88E+05	2.79E+05	0.77	5.19E-01	1.84E-01	1.01	4.89E-01	9.43E-01	1.87E+05	1.89E+05
1.67E+05	1.73E+05	1.98E+05	4.18E+05	2.14E+05	2.04E+05	0.77	6.75E-01	2.44E-01	1.01	6.49E-01	9.58E-01	1.63E+05	1.64E+05
6.31E+05	7.73E+05	7.73E+05	1.19E+06	1.23E+06	9.19E+05	0.79	7.65E-01	3.70E-01	1.01	8.14E-01	9.67E-01	6.72E+05	6.78E+05
1.17E+05	1.23E+05	1.42E+05	2.18E+05	1.85E+05	1.53E+05	0.78	5.60E-01	1.95E-01	1.01	5.21E-01	9.50E-01	1.10E+05	1.11E+05
7.77E+04	7.48E+04	6.38E+04	1.31E+05	1.33E+05	1.19E+05	0.80	8.09E-01	3.86E-01	1.01	8.91E-01	9.71E-01	6.79E+04	6.85E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568915917	Tyrosine-protein phosphatase non-receptor type substrate 1	5	SVSVAAGDSTVLNCTLSLLPVGPIR	Carbamidomethyl(14)Deamidated(13)	5.78	3	876.8
392871558	Receptor-type tyrosine-protein phosphatase C	3	SLPNNVTSFEVESLKPYK	Deamidated(4)Deamidated(5)	5.64	3	685.0
113865977	Lactadherin	2	NNTIPDSQMSASSSYK	Deamidated(2)Oxidation(9)	2.54	2	873.9
568947434	Aminopeptidase N	9	KLNYTLK	Deamidated(3)	2.91	2	440.8
111955312	OX-2 membrane glycoprotein	1	GTGTGIENSTESHFHSNGTTSVTSI LR	Deamidated(8)Deamidated(17)	5.84	3	931.4
254028203	GPI inositol-deacylase	2	HINLTTLVAGGFR	Deamidated(3)	4.4	3	496.3
755537649	Platelet endothelial cell adhesion molecule	8	EVTEGGVVTVNCSLQEEKPPIFFK	Carbamidomethyl(12)Deamidated(11)	6.34	3	903.5
208609939	Receptor-type tyrosine phosphatase	2	TNSTQVSDVR	Deamidated(2)	3.53	2	554.3
110347564	Truncated ceruloplasmin	2	EYEGAVYPDNTTDFQR	Deamidated(10)	4.63	2	953.4
153792543	ATP-binding cassette sub-family A member 9	2	VDNFNDSNYMMVFAPSEATHEIM NK	Deamidated(5)Oxidation(10)Oxidation(11)Oxidation(24)	6.34	3	1028.1
569000314	Elastin microfibril interfacier 2	3	DTYVEAVLSVSNASVAQLHTAGYR	Deamidated(12)	7.66	3	851.4
755537649	Platelet endothelial cell adhesion molecule	8	DDAMVYNVTSR	Deamidated(7)Oxidation(4)	2.88	2	644.3
568920137	Laminin subunit alpha-5	15	VFDLHQNMGSVNVSVGCTPAQLIE TSR	Carbamidomethyl(17)Deamidated(12) Oxidation(8)	7.99	3	992.8
153791389	Integrin alpha-1	13	ANQIVIPHNTTFQTEPTK	Deamidated(9)	4.25	3	680.7
6753332	Monocyte differentiation antigen CD14	3	LDRNPSPDELPQVGNLSLK	Deamidated(15)	3.6	3	698.7
227908803	Nodal modulator 1	2	LENITTGTytiHAQK	Deamidated(3)	4.06	3	564.3
755532856	Laminin, alpha 2	17	ICNQNSSNPYQR	Carbamidomethyl(2)Deamidated(5)	3.44	2	741.3
568922098	Prostaglandin F2 receptor negative regulator	3	YSVLITAEKPVGDLSSPNETK	Deamidated(18)	4.85	3	750.4
6678347	Thy-1 membrane glycoprotein	3	VLTLANFTTK	Deamidated(6)	2.81	2	554.8
225903442	Integrin alpha-5	6	LSPIHIALNFSLDPK	Deamidated(9)	3.27	3	556.0
27369644	Inter-alpha-trypsin inhibitor heavy chain H5	2	AEGDVGPPPSTLINQNETFAK	Deamidated(16)	4.98	2	1093.5
568939794	Transmembrane protein 106B	1	LNNITNIGPLDMK	Deamidated(2)Deamidated(3)Oxidation(12)	3.71	2	730.4
121674797	Palmitoyl-protein thioesterase 1	2	NYSIFLADINQER	Deamidated(1)	3.84	2	792.4
569000314	Elastin microfibril interfacier 2	3	LGIVLQAANSSDVELTPMGALPEQ PGAENEQVLMELSR	Deamidated(9)Deamidated(30)Oxidation(18)Oxidation(35)	5.65	4	1035.0
568914609	Protein O-mannosyl-transferase 1	1	FVHVNTSAILK	Deamidated(5)	4.18	3	410.6
16716463	Mucolipin-1	1	GHVDPANDTFDIDPR	Deamidated(7)	3.62	3	557.3

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2628.4	67.5	20	1.64E+05	2.94E+05	5.47E+05	1.19E+05	3.53E+05	2.77E+05	7.02E+04	2.44E+05	7.14E+04	1.97E+04	2.40E+05
2053.1	44.8	55	1.83E+05	2.36E+05	3.77E+05	1.31E+05	2.29E+05	2.31E+05	1.40E+05	2.01E+05	1.21E+05	6.42E+04	1.45E+05
1746.7	24.7	17	1.49E+05	1.64E+05	1.86E+05	0.00E+00	2.11E+05	1.91E+05	1.57E+05	1.06E+05	1.06E+05	5.40E+04	8.96E+04
880.5	25.3	5	2.06E+06	2.10E+06	2.34E+06	0.00E+00	2.25E+06	1.77E+06	1.83E+06	1.39E+06	8.75E+05	5.62E+05	1.23E+06
2792.3	37.3	37	1.23E+06	1.50E+06	1.95E+06	6.53E+05	2.53E+06	2.35E+06	7.07E+05	1.78E+06	8.48E+05	6.52E+05	1.63E+06
1486.8	45.4	13	8.93E+04	8.90E+04	1.39E+05	4.31E+04	1.39E+05	1.57E+05	5.46E+04	1.14E+05	6.91E+04	5.16E+04	1.12E+05
2708.4	49.2	19	2.96E+05	3.17E+05	6.02E+05	2.22E+05	7.42E+05	6.69E+05	1.32E+05	4.24E+05	2.25E+05	1.66E+05	5.03E+05
1107.5	19.1	16	1.42E+05	1.29E+05	1.24E+05	2.54E+02	1.70E+05	1.71E+04	1.16E+05	2.06E+05	5.82E+04	7.79E+04	1.22E+05
1905.8	36.7	23	5.64E+05	5.91E+05	7.19E+05	5.22E+05	9.89E+05	9.29E+05	5.40E+05	4.81E+05	4.64E+05	3.26E+05	6.25E+05
3082.3	42.8	15	3.32E+05	3.42E+05	4.88E+05	2.08E+05	4.95E+05	5.15E+05	2.31E+05	3.80E+05	2.25E+05	2.36E+05	1.91E+05
2552.3	56.0	20	1.86E+05	3.05E+05	4.46E+05	2.05E+05	5.34E+05	4.56E+05	7.71E+04	2.64E+05	1.32E+05	7.54E+04	2.65E+05
1287.6	29.2	35	6.90E+05	5.30E+05	7.89E+05	3.76E+05	1.19E+06	1.05E+06	6.22E+05	6.35E+05	4.01E+05	3.11E+05	6.83E+05
2976.4	47.4	38	6.15E+05	7.72E+05	1.47E+06	3.62E+05	2.05E+06	1.68E+06	3.12E+05	1.00E+06	4.41E+05	3.61E+05	1.26E+06
2040.0	35.0	37	1.26E+06	1.23E+06	1.46E+06	5.87E+05	1.50E+06	1.55E+06	8.53E+05	8.97E+05	6.97E+05	4.93E+05	9.28E+05
2094.1	43.6	16	6.38E+05	5.33E+05	8.29E+05	3.02E+05	7.90E+05	6.97E+05	3.78E+05	4.06E+05	4.04E+05	2.01E+05	5.38E+05
1690.9	31.4	20	1.11E+06	8.43E+05	1.31E+06	6.67E+05	2.04E+06	1.79E+06	6.63E+05	1.16E+06	6.74E+05	7.34E+05	8.53E+05
1481.6	19.9	17	6.16E+05	2.81E+04	1.15E+05	0.00E+00	1.75E+06	1.60E+06	8.52E+05	7.53E+04	6.67E+04	7.67E+03	2.43E+05
2249.2	39.8	15	1.54E+05	1.55E+05	1.89E+05	8.70E+04	2.69E+05	2.77E+05	1.20E+05	1.95E+05	9.35E+04	6.70E+04	1.48E+05
1108.6	46.5	34	7.14E+06	1.07E+07	9.87E+06	5.70E+06	1.19E+07	1.22E+07	5.76E+06	8.48E+06	4.65E+06	3.00E+06	7.33E+06
1665.9	53.8	7	9.48E+04	1.64E+05	2.43E+05	8.42E+04	1.49E+05	1.48E+05	4.48E+04	1.27E+05	3.23E+04	1.18E+04	6.26E+04
2186.1	43.0	15	6.42E+04	2.91E+04	1.35E+05	9.09E+04	9.94E+04	9.50E+04	3.64E+04	6.38E+04	2.12E+04	4.82E+04	1.91E+05
1459.7	40.4	45	1.81E+05	2.23E+05	5.82E+05	1.16E+05	4.70E+05	3.59E+05	2.08E+05	2.37E+05	1.67E+05	1.34E+05	2.33E+05
1583.8	55.6	23	5.05E+05	3.98E+05	4.63E+05	1.95E+05	7.74E+05	6.45E+05	1.79E+05	3.40E+05	1.64E+05	1.67E+05	3.83E+05
4137.0	61.1	24	8.43E+04	1.31E+05	3.13E+05	8.95E+04	3.35E+05	3.31E+05	2.43E+03	1.55E+05	5.40E+04	1.80E+04	1.49E+05
1229.7	36.4	5	6.87E+04	5.65E+04	1.09E+05	3.45E+04	1.49E+05	1.22E+05	3.69E+04	9.01E+04	3.73E+04	2.57E+04	9.02E+04
1669.7	34.9	8	1.33E+05	1.06E+05	1.53E+05	4.80E+04	1.78E+05	1.85E+05	7.69E+04	1.07E+05	4.80E+04	4.51E+04	1.07E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
9.37E+04	1.42E+05	1.28E+05	2.87E+05	3.02E+05	3.19E+05	0.81	9.87E-01	4.87E-01	1.01	1.07E+00	9.78E-01	1.34E+05	1.35E+05
1.28E+05	1.80E+05	1.32E+05	2.52E+05	1.85E+05	2.27E+05	0.80	5.96E-01	2.39E-01	1.01	6.17E-01	9.67E-01	1.19E+05	1.20E+05
7.53E+04	9.07E+04	1.05E+05	2.35E+05	1.75E+05	8.54E+04	0.81	7.92E-01	3.77E-01	1.00	8.20E-01	9.81E-01	8.23E+04	8.27E+04
7.36E+05	1.30E+06	1.09E+06	2.12E+06	1.64E+06	1.73E+06	0.80	6.95E-01	3.19E-01	1.00	6.98E-01	9.81E-01	9.40E+05	9.43E+05
7.99E+05	1.05E+06	1.18E+06	1.44E+06	1.44E+06	1.27E+06	0.78	5.87E-01	2.40E-01	1.00	5.95E-01	9.81E-01	8.68E+05	8.71E+05
6.44E+04	7.88E+04	5.41E+04	9.86E+04	8.46E+04	8.36E+04	0.79	5.33E-01	1.99E-01	1.00	5.71E-01	9.81E-01	5.81E+04	5.83E+04
2.50E+05	2.63E+05	2.30E+05	4.34E+05	3.78E+05	2.71E+05	0.77	7.03E-01	2.94E-01	1.00	7.29E-01	9.85E-01	2.29E+05	2.30E+05
5.76E+04	6.80E+04	6.13E+04	1.06E+05	7.57E+04	1.34E+05	0.82	7.98E-01	4.60E-01	1.00	9.42E-01	9.91E-01	6.49E+04	6.51E+04
4.76E+05	4.85E+05	4.69E+05	6.08E+05	4.72E+05	4.92E+05	0.77	3.74E-01	6.05E-02	1.00	3.58E-01	9.78E-01	3.70E+05	3.71E+05
1.47E+05	2.89E+05	2.50E+05	3.77E+05	4.90E+05	2.71E+05	0.79	5.71E-01	1.94E-01	1.00	5.76E-01	9.99E-01	2.07E+05	2.07E+05
2.62E+05	1.57E+05	1.45E+05	2.89E+05	3.17E+05	2.66E+05	0.77	7.13E-01	2.87E-01	1.00	7.56E-01	9.99E-01	1.63E+05	1.63E+05
4.54E+05	4.49E+05	5.39E+05	6.94E+05	6.21E+05	5.24E+05	0.77	4.88E-01	1.37E-01	1.00	4.38E-01	9.99E-01	3.97E+05	3.97E+05
4.61E+05	6.97E+05	6.44E+05	8.88E+05	7.64E+05	8.07E+05	0.76	7.78E-01	3.36E-01	1.00	8.28E-01	9.95E-01	5.41E+05	5.41E+05
6.76E+05	8.06E+05	8.81E+05	1.25E+06	9.97E+05	8.97E+05	0.78	4.53E-01	1.08E-01	1.00	4.19E-01	9.85E-01	6.42E+05	6.41E+05
2.70E+05	3.79E+05	3.96E+05	5.87E+05	5.97E+05	5.38E+05	0.79	5.48E-01	1.89E-01	1.00	5.06E-01	9.82E-01	3.20E+05	3.19E+05
6.59E+05	7.12E+05	7.98E+05	1.28E+06	1.11E+06	8.07E+05	0.76	5.26E-01	1.70E-01	1.00	4.90E-01	9.73E-01	6.50E+05	6.47E+05
3.37E+05	5.31E+05	3.70E+05	6.17E+05	5.04E+05	5.23E+05	0.69	1.19E+00	4.86E-01	0.99	1.60E+00	9.90E-01	2.86E+05	2.84E+05
7.83E+04	1.21E+05	1.17E+05	2.07E+05	1.90E+05	1.45E+05	0.79	6.03E-01	2.22E-01	0.99	5.78E-01	9.69E-01	9.83E+04	9.77E+04
4.17E+06	6.57E+06	5.79E+06	9.56E+06	7.72E+06	9.27E+06	0.79	5.33E-01	1.67E-01	0.99	5.13E-01	9.64E-01	4.90E+06	4.87E+06
4.70E+04	4.31E+04	1.16E+05	1.79E+05	1.56E+05	1.55E+05	0.80	9.52E-01	4.44E-01	0.99	1.07E+00	9.83E-01	6.82E+04	6.79E+04
3.42E+04	3.21E+04	1.54E+04	1.51E+04	2.74E+04	4.71E+04	0.73	1.21E+00	4.40E-01	0.99	1.50E+00	9.89E-01	3.88E+04	3.86E+04
2.08E+05	1.80E+05	1.91E+05	2.58E+05	2.89E+05	2.22E+05	0.76	5.87E-01	2.41E-01	0.99	5.67E-01	9.70E-01	1.60E+05	1.59E+05
1.90E+05	2.30E+05	2.54E+05	4.95E+05	4.41E+05	3.26E+05	0.76	6.97E-01	2.67E-01	0.99	6.60E-01	9.68E-01	2.27E+05	2.26E+05
1.16E+05	7.09E+04	7.03E+04	1.94E+05	2.17E+05	1.84E+05	0.77	1.01E+00	4.47E-01	0.99	1.10E+00	9.80E-01	9.11E+04	9.05E+04
3.57E+04	5.98E+04	6.78E+04	6.08E+04	7.99E+04	5.80E+04	0.76	6.78E-01	2.63E-01	0.99	7.26E-01	9.65E-01	4.43E+04	4.40E+04
6.47E+04	8.18E+04	8.55E+04	1.12E+05	1.07E+05	9.51E+04	0.76	5.42E-01	1.73E-01	0.99	5.09E-01	9.51E-01	6.49E+04	6.43E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
226958456	histidine-rich glycoprotein	1	YSNESQDLSVNGYNCTTSSVSSALR	Carbamidomethyl(15)Deamidated(3)Deamidated(11)Deamidated(14)	4.98	3	914.7
568905353	Extracellular sulfatase	3	TFAVYLNNTGYR	Deamidated(7)	3.23	2	710.3
568920948	Protocadherin Fat 4	3	INITISDVNDHTPR	Deamidated(2)	4.09	3	532.6
6678459	Trans-Golgi network integral membrane protein 1	1	TDAELNETARPLSPVNP	Deamidated(6)	3.8	3	651.7
33859809	Fibrinogen beta chain	2	GTAGNALMDGASQLVGENR	Deamidated(18)Oxidation(8)	4.36	3	626.6
150378501	Carboxypeptidase D	4	DLDTDFTSNASQPETK	Deamidated(9)	4.81	2	885.4
156616286	Collagen alpha-6(VI) chain	11	GIFSDVSASVCNSSK	Carbamidomethyl(11)Deamidated(12)	3.89	2	779.9
6753066	Membrane primary amine oxidase	2	EALAIFFGGQPKPNVSELVVGPLPHPSYMR	Deamidated(15)Oxidation(30)	6.24	4	845.9
110347469	Alpha-2-macroglobulin	5	SLGEVNFTATAEALQSPELCGNK	Carbamidomethyl(20)Deamidated(6)	6.86	3	813.1
6754900	5'-nucleotidase	3	IKLDNYSTQELGR	Deamidated(5)	3.34	3	513.3
568947269	Alpha-mannosidase 2x	1	ANLTSMLIQR	Deamidated(2)Oxidation(6)	2.74	2	582.3
124494256	Prolow-density lipoprotein receptor-related protein 1	22	KLNLDGSNYTLLK	Deamidated(8)	3.31	3	493.9
157057166	Toll-like receptor 9	5	LGPEDLANLTSR	Deamidated(8)	4.12	2	700.4
568947434	Aminopeptidase N	9	AMFNITLIYPNNLIALSNMLPK	Deamidated(4)Deamidated(11)Oxidation(2)Oxidation(19)	3.76	3	842.1
568960103	N-acetylated-alpha-linked acidic dipeptidase 2	3	NYAASIFNISK	Deamidated(8)	2.6	2	636.3
568987678	Gamma-sarcoglycan	2	VDSSLLQSTQNVTSAR	Deamidated(12)	5.35	2	960.0
70608146	Kin of IRRE-like protein 1	1	VGSTNVSTLVNVHFAPR	Deamidated(5)	5.53	3	600.3
755504148	Lysosomal protein NCU-G1	2	GNHSLFGLEVATLGQGPDCPSVNER	Carbamidomethyl(19)Deamidated(2)	7.55	3	885.8
568960899	Neuroplastin	4	KNASNMEYR	Deamidated(2)Oxidation(6)	2.73	2	565.3
153791270	Laminin subunit gamma-1	12	RIPAINR	Deamidated(6)	2.44	2	420.8
153791389	Integrin alpha-1	13	VTLDFNLTDPENGPVLDDALPNSVHGHIPIFAK	Deamidated(6)	7.65	4	861.7
160358825	Beta-2-glycoprotein 1	3	YTSFEYPKNISFACNPGFFLNGTSSSK	Carbamidomethyl(14)Deamidated(9)Deamidated(21)	4.86	3	1022.5
13384938	Endoplasmic reticulum-Golgi intermediate compartment protein 3	2	SFQQSHVHVHDLQSFGLDNINMTHYIK	Deamidated(21)Oxidation(22)	7.64	4	803.9
568947434	Aminopeptidase N	9	KQVTPLFFYFQNR	Deamidated(12)	4.04	3	563.6
54873610	Receptor tyrosine-protein kinase erbB-2	1	YALAVLDNRDPLDNVTTAAPGR	Deamidated(14)	6.23	3	781.7
568960005	Choline transporter-like protein 2	3	GVLMSGNETTYEDGHGAR	Deamidated(7)Oxidation(4)	4	3	641.6
58037305	Alpha-(1,3)-fucosyltransferase 11	1	LFNLTATFSR	Deamidated(3)	2.65	2	585.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2742.2	41.8	11	6.00E+04	1.09E+05	1.20E+05	9.57E+04	2.29E+05	2.24E+05	7.37E+04	9.25E+04	9.59E+04	6.29E+04	1.13E+05
1419.7	42.8	2	1.06E+05	1.57E+05	1.97E+05	9.85E+04	2.64E+05	2.64E+05	4.87E+04	1.13E+05	6.75E+04	6.83E+04	1.49E+05
1595.8	35.4	2	5.41E+04	6.04E+04	8.28E+04	3.27E+04	1.10E+05	1.01E+05	2.38E+04	7.97E+04	2.76E+04	1.98E+04	5.64E+04
1953.0	31.1	15	2.73E+05	1.77E+05	3.10E+05	1.23E+05	4.02E+05	3.27E+05	1.39E+05	2.02E+05	1.33E+05	1.28E+05	2.25E+05
1877.9	35.0	595	1.63E+07	2.71E+07	2.68E+07	4.19E+07	2.36E+07	2.17E+07	8.36E+06	1.98E+07	1.20E+07	1.44E+07	1.47E+07
1769.8	36.6	18	1.87E+05	2.31E+05	3.07E+05	1.32E+05	2.83E+05	2.41E+05	1.58E+05	1.81E+05	1.40E+05	8.54E+04	1.73E+05
1558.7	41.4	16	2.34E+05	2.60E+05	4.95E+05	1.15E+05	8.53E+05	7.51E+05	2.13E+05	3.94E+05	1.70E+05	1.56E+05	4.64E+05
3380.8	59.1	16	1.99E+06	1.56E+06	4.18E+06	1.02E+06	5.30E+06	4.57E+06	6.62E+05	2.10E+06	1.51E+06	1.56E+06	2.66E+06
2437.2	53.0	29	3.64E+05	5.54E+05	5.67E+05	4.14E+05	8.38E+05	7.79E+05	1.54E+05	4.43E+05	4.06E+05	2.21E+05	4.78E+05
1537.8	32.8	10	1.67E+05	1.66E+05	2.70E+05	1.14E+05	3.27E+05	2.78E+05	1.36E+05	1.89E+05	1.31E+05	8.09E+04	1.81E+05
1163.6	36.6	2	7.21E+05	7.21E+05	9.71E+05	4.50E+05	1.10E+06	8.95E+05	5.22E+05	6.52E+05	3.80E+05	3.82E+05	6.38E+05
1479.8	37.7	3	2.54E+05	2.30E+05	3.56E+05	1.66E+05	4.28E+05	4.22E+05	1.67E+05	2.22E+05	1.78E+05	1.01E+05	1.69E+05
1399.7	55.0	10	4.80E+05	4.18E+05	6.41E+05	3.03E+05	6.47E+05	5.45E+05	1.80E+05	4.61E+05	1.91E+05	1.86E+05	4.22E+05
2524.3	69.8	39	1.94E+05	2.58E+05	3.60E+05	1.13E+05	1.75E+05	1.44E+05	1.96E+04	2.56E+05	5.29E+04	1.53E+04	8.28E+04
1271.6	59.3	22	1.15E+06	1.50E+06	1.82E+06	7.93E+05	1.82E+06	1.76E+06	9.07E+05	1.18E+06	7.84E+05	5.14E+05	1.16E+06
1919.0	46.1	160	1.00E+06	1.78E+06	7.10E+05	3.00E+06	1.40E+06	1.24E+06	4.53E+05	1.07E+06	7.49E+05	1.08E+06	9.61E+05
1798.9	42.7	15	2.03E+05	3.52E+05	3.73E+05	1.32E+05	4.96E+05	3.58E+05	9.37E+04	3.35E+05	1.26E+05	8.60E+04	3.40E+05
2655.2	50.0	11	1.50E+05	1.96E+05	2.72E+05	3.53E+04	3.11E+05	3.30E+05	7.05E+04	2.02E+05	9.78E+04	7.54E+04	2.01E+05
1129.5	15.8	1	7.36E+04	4.27E+04	3.99E+04	0.00E+00	2.27E+04	0.00E+00	6.43E+04	2.96E+04	1.18E+04	1.13E+04	3.05E+04
840.5	21.1	6	4.26E+06	3.89E+06	5.52E+06	4.72E+02	9.24E+06	8.69E+06	5.17E+06	4.25E+06	2.45E+06	2.63E+06	1.40E+06
3443.7	55.4	31	5.13E+05	6.84E+05	9.69E+05	2.43E+05	8.56E+05	9.52E+05	4.16E+04	6.07E+05	2.05E+05	8.89E+04	5.37E+05
3065.4	55.1	10	4.79E+04	4.23E+04	1.20E+05	2.06E+04	4.38E+05	4.08E+05	2.78E+04	8.87E+04	7.86E+04	4.06E+04	5.16E+04
3212.5	38.1	37	5.03E+05	8.21E+05	9.15E+05	2.99E+05	9.80E+05	8.70E+05	2.14E+05	5.69E+05	3.00E+05	2.92E+05	5.30E+05
1688.9	48.9	13	3.63E+05	4.67E+05	5.75E+05	2.79E+05	5.80E+05	4.90E+05	1.76E+05	4.16E+05	2.35E+05	1.38E+05	3.15E+05
2343.2	48.3	11	7.62E+04	1.47E+05	2.07E+05	7.97E+04	1.68E+05	1.50E+05	4.53E+04	1.03E+05	6.23E+04	3.22E+04	1.09E+05
1922.9	30.1	78	1.53E+06	1.73E+06	1.92E+06	7.30E+05	2.30E+06	2.02E+06	1.37E+06	1.64E+06	1.05E+06	6.75E+05	1.42E+06
1170.6	50.8	3	3.80E+04	7.27E+04	9.76E+04	4.19E+04	1.24E+05	1.08E+05	2.80E+04	5.64E+04	2.84E+04	7.94E+03	6.38E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.01E+05	8.82E+04	7.43E+04	1.26E+05	7.71E+04	9.49E+04	0.75	5.52E-01	1.99E-01	0.99	6.04E-01	9.58E-01	6.99E+04	6.94E+04
8.64E+04	8.60E+04	1.15E+05	1.34E+05	1.24E+05	1.08E+05	0.75	5.94E-01	2.18E-01	0.99	5.92E-01	9.57E-01	8.16E+04	8.09E+04
2.61E+04	4.80E+04	4.52E+04	6.15E+04	7.67E+04	6.40E+04	0.78	6.94E-01	2.90E-01	0.99	7.04E-01	9.61E-01	3.63E+04	3.60E+04
9.87E+04	1.63E+05	1.60E+05	1.84E+05	2.65E+05	1.95E+05	0.76	5.57E-01	1.78E-01	0.99	4.92E-01	9.41E-01	1.32E+05	1.30E+05
2.59E+07	1.34E+07	1.24E+07	2.16E+07	1.28E+07	1.43E+07	0.74	5.52E-01	1.45E-01	0.99	7.56E-01	9.55E-01	1.26E+07	1.25E+07
1.21E+05	1.28E+05	1.67E+05	2.01E+05	2.18E+05	1.99E+05	0.78	4.59E-01	1.09E-01	0.99	4.13E-01	9.16E-01	1.20E+05	1.19E+05
2.02E+05	2.93E+05	2.51E+05	3.27E+05	2.72E+05	3.37E+05	0.74	7.45E-01	3.12E-01	0.99	7.92E-01	9.57E-01	2.15E+05	2.13E+05
1.90E+06	1.17E+06	1.76E+06	2.32E+06	2.09E+06	1.47E+06	0.73	6.77E-01	2.78E-01	0.99	7.53E-01	9.46E-01	1.42E+06	1.40E+06
3.11E+05	4.55E+05	2.53E+05	3.98E+05	3.11E+05	6.97E+05	0.78	6.34E-01	2.29E-01	0.99	6.67E-01	9.35E-01	2.92E+05	2.88E+05
1.01E+05	1.39E+05	1.34E+05	2.32E+05	2.15E+05	1.41E+05	0.77	5.63E-01	1.76E-01	0.99	5.19E-01	9.15E-01	1.14E+05	1.12E+05
4.03E+05	4.68E+05	5.43E+05	7.02E+05	6.25E+05	5.55E+05	0.76	4.19E-01	8.10E-02	0.99	3.53E-01	8.77E-01	4.07E+05	4.01E+05
1.56E+05	2.07E+05	1.68E+05	3.25E+05	2.94E+05	2.43E+05	0.77	5.82E-01	1.85E-01	0.99	5.26E-01	9.12E-01	1.54E+05	1.52E+05
1.81E+05	3.60E+05	2.68E+05	4.66E+05	3.78E+05	3.67E+05	0.77	5.58E-01	1.68E-01	0.99	5.64E-01	9.19E-01	2.45E+05	2.41E+05
5.41E+04	6.98E+04	1.17E+05	3.04E+05	2.76E+05	2.42E+05	0.83	1.15E+00	5.86E-01	0.98	1.29E+00	9.62E-01	1.02E+05	1.00E+05
5.83E+05	1.11E+06	8.49E+05	1.43E+06	1.24E+06	1.17E+06	0.77	5.09E-01	1.33E-01	0.98	4.83E-01	8.86E-01	7.50E+05	7.37E+05
1.68E+06	6.79E+05	6.01E+05	1.06E+06	6.06E+05	6.26E+05	0.72	7.24E-01	2.37E-01	0.98	1.03E+00	9.43E-01	7.29E+05	7.16E+05
1.63E+05	1.60E+05	1.37E+05	3.24E+05	2.11E+05	2.80E+05	0.77	7.30E-01	2.94E-01	0.98	7.90E-01	9.24E-01	1.58E+05	1.55E+05
1.09E+05	1.51E+05	8.52E+04	1.66E+05	1.42E+05	2.00E+05	0.76	6.96E-01	2.86E-01	0.98	7.28E-01	9.16E-01	1.06E+05	1.04E+05
2.12E+04	8.55E+03	3.78E+04	2.68E+04	2.94E+04	3.17E+04	0.78	9.70E-01	4.78E-01	0.98	1.15E+00	9.47E-01	1.86E+04	1.82E+04
2.80E+06	4.02E+06	3.07E+06	6.12E+06	4.89E+06	3.88E+06	0.75	7.45E-01	2.79E-01	0.98	7.70E-01	9.17E-01	2.72E+06	2.67E+06
2.73E+05	3.28E+05	3.78E+05	7.38E+05	6.71E+05	4.77E+05	0.77	8.47E-01	3.68E-01	0.98	9.12E-01	9.30E-01	3.19E+05	3.13E+05
7.97E+04	3.44E+04	9.83E+04	2.30E+05	1.70E+05	1.26E+05	0.73	1.33E+00	5.41E-01	0.98	1.50E+00	9.57E-01	7.58E+04	7.43E+04
3.64E+05	4.15E+05	3.51E+05	5.95E+05	6.00E+05	5.34E+05	0.76	5.66E-01	1.97E-01	0.98	5.28E-01	8.75E-01	3.47E+05	3.39E+05
1.78E+05	2.95E+05	2.12E+05	4.94E+05	4.65E+05	3.96E+05	0.78	6.18E-01	2.20E-01	0.98	6.05E-01	8.72E-01	2.30E+05	2.25E+05
6.10E+04	8.78E+04	7.03E+04	1.20E+05	1.16E+05	1.12E+05	0.77	6.38E-01	2.32E-01	0.98	6.40E-01	8.80E-01	6.60E+04	6.44E+04
8.06E+05	1.30E+06	1.14E+06	1.67E+06	1.56E+06	1.22E+06	0.77	4.55E-01	9.53E-02	0.97	4.51E-01	8.26E-01	9.25E+05	9.02E+05
3.35E+04	5.32E+04	4.32E+04	7.80E+04	3.84E+04	7.93E+04	0.75	7.76E-01	2.84E-01	0.97	8.21E-01	9.00E-01	3.70E+04	3.60E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
227500531	Collagen 16 alpha 1	1	LEHSSDPSTNVTGFNLIR	Deamidated(10)	5.64	3	663.3
32171188	TM2 domain-containing protein 1	1	LSITNETFR	Deamidated(5)	2.6	2	541.3
171543883	Nidogen-1	1	CVANYTGNGR	Carbamidomethyl(1)Deamidated(4)Deamidated(8)	3.01	2	557.2
568936922	P2X purinoceptor 4	4	AAENFTLLVK	Deamidated(4)	2.67	2	553.8
19527130	EMILIN-1	7	FNSTLGPSEEQEK	Deamidated(2)	3.85	2	733.8
41529818	Growth/differentiation factor 6	1	LGINASFFQSSK	Deamidated(4)	3.1	2	650.3
339895744	Collagen alpha-3(VI) chain	5	QNLTVTDR	Deamidated(2)	2.72	2	474.2
19527008	Group XV phospholipase A2	2	VFVYPTTNYTLR	Deamidated(9)	3.05	2	788.4
568954605	Macrophage scavenger receptor 1	3	SLQSLNMTLLDVQLHTETLNVR	Deamidated(6)Oxidation(7)	6.93	3	848.1
568947434	Aminopeptidase N	9	QVTPLFFYFQNR	Deamidated(11)	3.63	2	780.9
18087747	Protocadherin gamma subfamily C, 3	2	ITVLDANDNAPAFNQSLYR	Deamidated(14)	4.68	2	1062.0
6755144	Galectin-3-binding protein	3	GLNLTEDTYKPR	Deamidated(3)	3.58	3	469.9
124487171	Probable G-protein coupled receptor 116	3	ANEQVIQNLNHTYK	Deamidated(10)	4.64	3	558.3
6753332	Monocyte differentiation antigen CD14	3	NPSPDELPQVGNLCLK	Deamidated(12)	3.29	2	854.9
568994656	Leukocyte surface antigen CD47	3	DAMVGNITCEVTELSR	Carbamidomethyl(9)Deamidated(6)Oxidation(3)	4.2	2	931.4
19527206	CD276 antigen	3	TALFPDLLVQGNASLR	Deamidated(12)	4.04	2	858.5
85719301	carcinoembryonic antigen-related cell adhesion molecule 1	4	FVPNSNMNFTGQAYSGR	Deamidated(4)Deamidated(8)Oxidation(7)	3.75	2	953.9
90568038	ATP-binding cassette subfamily A member 1	3	EAFNETNQAIQTISR	Deamidated(4)	3.94	2	861.9
568920137	Laminin subunit alpha-5	15	LHRLNASIADLQSK	Deamidated(5)	3.67	3	523.0
568991301	Plexin B2	10	QGPQAGGTTTLTINGTHLDTGSK	Deamidated(13)	5.52	3	719.0
9055172	ATPase, H+ transporting, lysosomal accessory protein	2	QLLQTQVASPAIHPPVSYNDTAPR	Deamidated(19)	5.39	3	868.8
19527130	EMILIN-1	7	LEGLLANVSR	Deamidated(7)	3.4	2	536.8
27370240	Leucyl-cystinyl aminopeptidase	8	TNQSAELIQPVATNGK	Deamidated(2)Deamidated(14)	4	2	836.9
31543108	Lysosome-associated membrane glycoprotein 2	4	EVNVYMYLANGSAFNISNK	Deamidated(10)Deamidated(15)Oxidation(6)	5.16	3	718.0
160333372	Lumican	5	LHINYNNLTESVGPLPK	Deamidated(7)	3.97	3	637.7
568976482	Cystinosin	1	SKNLTIIVLPDEVIVPR	Deamidated(3)	3.1	3	641.7
568960899	Neuroplastin	4	ANATIEVK	Deamidated(2)	2.44	2	423.7
568931034	Endothelin-converting enzyme 1	3	HLLLENATASVSEAER	Deamidated(5)	4.75	3	543.3
6755144	Galectin-3-binding protein	3	ALGYENATQALGR	Deamidated(6)	3.36	2	682.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1988.0	41.1	17	2.52E+05	3.58E+05	4.40E+05	1.51E+05	5.59E+05	5.49E+05	1.14E+05	2.56E+05	9.20E+04	2.35E+05	2.09E+05
1081.6	36.9	5	1.22E+05	8.22E+04	1.51E+05	3.46E+04	2.08E+05	2.01E+05	8.35E+04	9.53E+04	7.08E+04	6.79E+04	1.02E+05
1113.5	21.4	19	1.70E+06	2.59E+05	6.05E+05	3.81E+02	3.01E+06	2.85E+06	1.40E+06	3.23E+05	1.33E+05	1.53E+05	1.03E+06
1106.6	44.5	11	1.57E+06	1.64E+06	1.73E+06	6.51E+05	1.70E+06	1.61E+06	5.95E+05	1.17E+06	5.97E+05	4.52E+05	1.22E+06
1466.7	27.8	29	1.46E+06	1.48E+06	1.63E+06	8.90E+05	3.08E+06	2.64E+06	1.08E+06	1.54E+06	7.75E+05	7.96E+05	1.70E+06
1299.7	47.2	3	8.37E+04	1.62E+05	1.48E+05	5.56E+04	1.56E+05	1.48E+05	3.09E+04	8.28E+04	2.97E+04	2.10E+04	6.84E+04
947.5	21.8	4	1.39E+05	1.01E+05	2.01E+05	2.65E+04	2.76E+05	2.71E+05	1.19E+05	1.09E+05	9.45E+04	9.70E+04	8.27E+04
1575.8	44.8	13	1.60E+05	1.44E+05	1.37E+05	7.10E+04	2.95E+05	2.09E+05	6.33E+04	9.41E+04	6.20E+04	8.46E+04	8.22E+04
2542.3	54.8	18	3.58E+05	7.51E+05	1.09E+06	2.75E+05	7.38E+05	7.30E+05	2.64E+05	4.94E+05	1.71E+05	5.08E+04	4.76E+05
1560.8	58.2	49	5.99E+05	8.19E+05	1.12E+06	4.32E+05	9.50E+05	8.85E+05	2.44E+05	6.67E+05	4.35E+05	2.43E+05	6.67E+05
2123.0	48.3	5	5.96E+04	6.74E+04	6.73E+04	4.59E+04	1.31E+05	1.20E+05	4.39E+04	6.72E+04	3.20E+04	2.65E+04	5.25E+04
1407.7	31.3	20	6.12E+05	4.70E+05	7.57E+05	3.05E+05	9.89E+05	9.07E+05	4.41E+05	4.94E+05	2.29E+05	2.13E+05	4.98E+05
1672.8	30.5	12	1.38E+05	8.29E+04	1.40E+05	6.35E+04	1.90E+05	1.90E+05	6.43E+04	8.41E+04	5.27E+04	6.52E+04	8.11E+04
1708.9	47.0	17	2.15E+05	2.53E+05	2.79E+05	1.79E+05	2.55E+05	2.44E+05	1.54E+05	1.97E+05	1.73E+05	7.45E+04	2.21E+05
1861.8	42.4	37	2.08E+06	2.33E+06	3.04E+06	1.11E+06	3.41E+06	2.88E+06	1.83E+06	1.66E+06	1.46E+06	9.59E+05	2.07E+06
1715.9	59.2	24	1.94E+05	3.80E+05	5.26E+05	1.82E+05	3.69E+05	2.95E+05	5.68E+04	3.20E+05	1.24E+05	4.08E+04	3.29E+05
1906.8	33.4	38	3.28E+05	3.76E+05	4.43E+05	2.97E+05	6.24E+05	6.12E+05	3.12E+05	3.24E+05	2.70E+05	2.10E+05	3.70E+05
1722.8	39.3	7	2.01E+05	2.45E+05	2.62E+05	1.27E+05	3.10E+05	2.67E+05	2.24E+05	1.85E+05	1.09E+05	8.42E+04	2.07E+05
1566.9	30.0	3	1.05E+05	1.01E+05	1.71E+05	6.36E+04	3.86E+05	3.56E+05	7.21E+04	1.21E+05	8.35E+04	1.02E+05	6.57E+04
2155.1	33.6	12	3.97E+05	3.11E+05	5.44E+05	1.58E+05	4.81E+05	5.36E+05	2.68E+05	3.22E+05	1.82E+05	1.75E+05	2.65E+05
2604.3	41.3	17	1.63E+05	1.54E+05	2.76E+05	7.02E+04	2.68E+05	2.75E+05	1.12E+05	1.53E+05	1.09E+05	1.02E+05	1.51E+05
1072.6	41.7	50	1.11E+07	1.23E+07	1.93E+07	7.67E+06	2.56E+07	2.32E+07	7.15E+06	1.21E+07	6.26E+06	8.26E+06	1.20E+07
1672.8	35.0	55	4.58E+05	3.82E+05	7.61E+05	2.08E+05	8.29E+05	7.24E+05	4.33E+05	4.71E+05	2.96E+05	1.90E+05	4.35E+05
2152.0	57.2	74	1.39E+06	2.04E+06	1.64E+06	1.53E+06	2.98E+06	2.59E+06	4.15E+05	2.11E+06	7.92E+05	7.86E+05	1.62E+06
1911.0	42.8	253	1.60E+05	1.68E+05	3.38E+05	2.01E+05	5.55E+05	4.88E+05	7.62E+04	3.46E+05	1.53E+05	1.87E+05	2.96E+05
1923.1	50.1	9	1.23E+05	1.46E+05	2.33E+05	8.13E+04	2.93E+05	2.55E+05	7.14E+04	1.52E+05	6.83E+04	7.00E+04	1.80E+05
846.5	21.9	6	7.01E+05	5.84E+05	7.95E+05	7.92E+02	1.09E+06	1.06E+06	5.71E+05	5.88E+05	2.99E+05	2.32E+05	5.43E+05
1627.8	31.6	18	1.63E+05	2.31E+05	2.37E+05	1.05E+05	2.40E+05	1.95E+05	1.44E+05	1.43E+05	1.10E+05	6.48E+04	1.33E+05
1364.7	36.9	27	1.67E+06	1.40E+06	2.11E+06	8.27E+05	2.60E+06	2.37E+06	1.03E+06	1.17E+06	6.12E+05	6.55E+05	1.37E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.50E+05	3.08E+05	1.50E+05	1.79E+05	2.21E+05	3.04E+05	0.71	6.15E-01	1.94E-01	0.97	7.43E-01	8.90E-01	1.70E+05	1.66E+05
6.87E+04	6.86E+04	8.22E+04	8.72E+04	1.14E+05	9.95E+04	0.74	5.29E-01	1.79E-01	0.97	4.63E-01	8.45E-01	6.60E+04	6.42E+04
2.54E+05	5.51E+05	6.98E+05	1.22E+06	1.33E+06	1.30E+06	0.71	1.14E+00	4.57E-01	0.97	1.36E+00	9.41E-01	5.90E+05	5.75E+05
5.60E+05	9.13E+05	7.67E+05	1.42E+06	1.11E+06	1.24E+06	0.77	5.87E-01	1.85E-01	0.97	5.90E-01	8.59E-01	7.18E+05	6.99E+05
8.90E+05	1.31E+06	8.83E+05	1.11E+06	1.54E+06	1.35E+06	0.74	5.57E-01	1.64E-01	0.97	5.29E-01	8.43E-01	9.12E+05	8.87E+05
8.39E+04	6.71E+04	6.37E+04	1.27E+05	7.08E+04	8.93E+04	0.74	7.02E-01	2.41E-01	0.97	8.30E-01	8.97E-01	5.60E+04	5.45E+04
7.00E+04	7.04E+04	1.07E+05	1.47E+05	1.47E+05	1.65E+05	0.75	6.76E-01	2.50E-01	0.97	6.45E-01	8.71E-01	8.39E+04	8.16E+04
8.83E+04	1.04E+05	7.55E+04	1.35E+05	1.00E+05	1.22E+05	0.72	5.58E-01	1.87E-01	0.97	5.50E-01	8.54E-01	7.63E+04	7.42E+04
3.57E+05	2.49E+05	2.96E+05	7.95E+05	5.76E+05	5.09E+05	0.77	8.49E-01	3.41E-01	0.97	9.41E-01	9.01E-01	3.05E+05	2.96E+05
3.04E+05	4.78E+05	3.43E+05	8.52E+05	7.17E+05	6.62E+05	0.78	6.50E-01	2.41E-01	0.97	6.50E-01	8.58E-01	3.97E+05	3.85E+05
4.18E+04	4.79E+04	3.94E+04	8.82E+04	8.05E+04	4.39E+04	0.75	6.55E-01	2.06E-01	0.97	6.21E-01	8.50E-01	3.96E+04	3.85E+04
2.93E+05	4.68E+05	3.65E+05	5.89E+05	4.99E+05	4.79E+05	0.74	5.47E-01	1.44E-01	0.97	5.03E-01	8.16E-01	3.23E+05	3.13E+05
6.48E+04	7.95E+04	8.37E+04	9.67E+04	1.06E+05	6.88E+04	0.72	4.82E-01	1.32E-01	0.97	4.59E-01	8.12E-01	6.24E+04	6.05E+04
1.19E+05	1.41E+05	1.45E+05	2.32E+05	2.26E+05	1.98E+05	0.78	4.26E-01	8.60E-02	0.97	4.57E-01	7.86E-01	1.28E+05	1.24E+05
1.17E+06	1.64E+06	1.51E+06	2.04E+06	2.06E+06	1.82E+06	0.75	4.59E-01	9.48E-02	0.97	3.98E-01	7.61E-01	1.26E+06	1.22E+06
1.48E+05	2.03E+05	1.18E+05	2.84E+05	2.76E+05	2.98E+05	0.78	7.93E-01	3.38E-01	0.97	8.83E-01	8.88E-01	1.57E+05	1.52E+05
2.66E+05	2.87E+05	2.88E+05	3.56E+05	2.60E+05	3.19E+05	0.74	3.80E-01	5.55E-02	0.97	3.63E-01	7.35E-01	2.29E+05	2.21E+05
1.28E+05	1.48E+05	1.10E+05	2.42E+05	1.83E+05	1.93E+05	0.75	4.81E-01	8.93E-02	0.97	4.28E-01	7.67E-01	1.23E+05	1.19E+05
1.05E+05	6.93E+04	7.59E+04	2.53E+05	1.98E+05	6.90E+04	0.72	9.80E-01	3.66E-01	0.97	1.05E+00	9.04E-01	8.92E+04	8.64E+04
2.19E+05	2.34E+05	2.48E+05	4.29E+05	2.95E+05	2.49E+05	0.74	5.12E-01	1.21E-01	0.97	4.95E-01	8.01E-01	2.03E+05	1.96E+05
1.05E+05	1.11E+05	1.15E+05	1.84E+05	1.51E+05	1.25E+05	0.74	4.95E-01	1.37E-01	0.97	4.63E-01	7.92E-01	1.01E+05	9.72E+04
7.76E+06	1.10E+07	7.43E+06	1.16E+07	1.17E+07	1.03E+07	0.72	5.10E-01	1.55E-01	0.97	4.92E-01	8.07E-01	7.74E+06	7.48E+06
2.50E+05	3.20E+05	3.67E+05	5.34E+05	5.61E+05	4.01E+05	0.75	5.77E-01	1.68E-01	0.97	5.20E-01	8.00E-01	2.89E+05	2.79E+05
1.39E+06	1.13E+06	9.65E+05	1.56E+06	1.42E+06	1.34E+06	0.74	5.20E-01	1.55E-01	0.97	5.87E-01	8.30E-01	9.86E+05	9.53E+05
1.15E+05	1.79E+05	1.20E+05	2.09E+05	2.55E+05	2.85E+05	0.74	6.94E-01	2.65E-01	0.97	7.34E-01	8.61E-01	1.57E+05	1.52E+05
7.89E+04	1.06E+05	9.29E+04	1.34E+05	1.32E+05	1.37E+05	0.74	6.20E-01	2.01E-01	0.97	6.12E-01	8.31E-01	8.87E+04	8.57E+04
3.23E+05	4.16E+05	4.56E+05	6.32E+05	5.99E+05	5.73E+05	0.75	6.29E-01	2.26E-01	0.97	5.93E-01	8.27E-01	3.58E+05	3.46E+05
1.07E+05	1.07E+05	1.33E+05	2.09E+05	1.62E+05	1.41E+05	0.76	4.77E-01	9.26E-02	0.96	4.69E-01	7.62E-01	1.01E+05	9.73E+04
7.52E+05	1.21E+06	8.62E+05	1.50E+06	1.20E+06	1.38E+06	0.73	5.41E-01	1.36E-01	0.96	4.92E-01	7.75E-01	8.54E+05	8.23E+05

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Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
27370240	Leucyl-cystinyl aminopeptidase	8	EETLLYDNATSSVADRK	Deamidated(8)	5.38	3	638.3
568922258	Sortilin	2	DITNLINNTFIR	Deamidated(7)	3.92	2	717.9
357588455	Extracellular sulfatase Sulf-2	3	LFPNASQHITPSYNYAPNPK	Deamidated(4)	3.8	3	792.4
568935277	SPARC-like protein 1	1	ILDQACGTDNQTYASSCHLFATK	Carbamidomethyl(6)Carbamidomethyl(17)Deamidated(10)	4.51	3	868.1
568911077	Nicastrin	4	SYLDDRPLQHYIAVSSPTNTTYVVQYALANLTGK	Deamidated(19)Deamidated(30)	8.29	4	951.0
6753224	C3a anaphylatoxin chemotactic receptor	1	LSLPESNSTDNSTAQLTGHMNDR	Deamidated(7)Deamidated(11)Oxidation(20)	5.9	3	836.0
10946680	Fibromodulin	3	VPNNALEGLENLTAALYHHNEIQEVGSSMR	Deamidated(11)Oxidation(29)	4.03	4	841.9
568911032	Cellular repressor of E1A-stimulated genes 1	1	VNKTEEDYAR	Deamidated(2)	3.15	3	409.2
6679389	Plexin-A1	2	LSGNLTLR	Deamidated(4)	2.81	2	494.3
755532856	Laminin, alpha 2	17	ELEDNLKKNISEIK	Deamidated(9)	4.2	3	558.6
568922760	Immunoglobulin superfamily member 10	6	FHVLPNGTLSIQR	Deamidated(6)	3.82	3	494.9
568910633	Glycosaminoglycan xylosylkinase	1	TEVKPVATEQLLSTFLTVMGNTCFYGK	Carbamidomethyl(23)Deamidated(20)	6.38	3	1006.8
568954605	Macrophage scavenger receptor 1	3	VLNNITNDLR	Deamidated(3)Deamidated(4)	3.24	2	587.3
568954529	Protocadherin Fat 1	6	LEPTPPIQFTHFQYNVTVHENSAAK	Deamidated(15)	4.39	4	718.1
124494256	Prolow-density lipoprotein receptor-related protein 1	22	LNLDGSNYTLLK	Deamidated(7)	3.73	2	676.4
6753484	Collagen alpha-1(VI) chain	5	ENYAELLDDGFLKNITAQICIDKK	Carbamidomethyl(20)Deamidated(14)	7.56	4	703.9
116734815	Glucosylceramidase	2	DLGPALANSSHDVK	Deamidated(8)	4.55	3	475.6
124494256	Prolow-density lipoprotein receptor-related protein 1	22	NSTTLVMHMK	Deamidated(1)Oxidation(7)Oxidation(9)	2.58	2	597.8
568954537	Toll-like receptor 3	1	LTHIPDDLPSNITVLNLTHNQLR	Deamidated(11)Deamidated(16)	5.86	4	657.4
568947434	Aminopeptidase N	9	NPNNNTIHPNLR	Deamidated(3)Deamidated(4)	3.76	3	468.9
110347469	Alpha-2-macroglobulin	5	VVSVDISFRPLNETFPVVIETPK	Deamidated(12)	4.48	3	917.5
90568038	ATP-binding cassette sub-family A member 1	3	GENPSQYGITAFNHPLNLTK	Deamidated(17)	6.39	3	734.7
111955338	Ly-9.2 antigen	1	VSEDEGYSLYMSNLTK	Deamidated(12)Oxidation(10)	4.47	2	862.4
6680840	Calumenin	2	NATYGYVLDDPDPDDGFNYK	Deamidated(1)	3.45	3	760.7
226246610	Alpha-mannosidase 2	3	FAVESLVPSSLSLMHSPPDAQNMS EVSLSPMEISTFR	Deamidated(22)Oxidation(14)Oxidation(23)Oxidation(31)	5.27	3	1357.3
111607447	Integrin beta	2	VTLYLRPGQAAAFNVTFR	Deamidated(14)	3.34	3	675.7
755522163	Integrin alpha-M	8	AFFDETKNNTR	Deamidated(8)	3.01	2	672.3
568926396	Tenascin	12	ESGLNMTLPEENQPVVFNHIYNIK	Deamidated(12)Deamidated(18)Oxidation(6):Carbamyl	4.42	3	934.8

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MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1912.9	34.0	18	5.42E+05	2.64E+05	4.31E+05	1.80E+05	6.78E+05	6.41E+05	1.70E+05	2.33E+05	1.91E+05	2.30E+05	2.32E+05
1434.8	61.7	18	2.64E+05	4.60E+05	6.09E+05	2.03E+05	6.14E+05	5.29E+05	1.40E+05	4.24E+05	2.40E+05	1.12E+05	3.26E+05
2375.1	38.1	11	3.75E+05	4.47E+05	5.35E+05	3.01E+05	6.65E+05	6.50E+05	2.93E+05	4.05E+05	3.30E+05	2.30E+05	3.83E+05
2602.2	37.2	2	3.08E+04	9.25E+04	1.33E+05	5.60E+04	1.50E+05	1.27E+05	1.10E+05	8.44E+04	7.68E+04	2.43E+04	4.68E+04
3800.9	63.5	22	2.33E+05	2.51E+05	4.16E+05	7.82E+04	4.31E+05	4.15E+05	1.96E+04	2.39E+05	8.32E+04	5.30E+04	1.39E+05
2506.1	32.7	7	7.66E+04	1.13E+05	1.12E+05	4.10E+04	2.00E+05	1.80E+05	8.70E+04	2.02E+05	3.85E+04	5.38E+04	1.33E+05
3364.7	56.5	205	3.83E+06	4.85E+06	6.98E+06	3.96E+06	9.60E+06	8.08E+06	1.79E+05	5.46E+06	1.41E+06	1.85E+06	5.16E+06
1225.6	17.6	2	1.18E+05	2.56E+04	6.52E+04	1.75E+01	1.78E+05	9.24E+04	7.73E+04	1.75E+04	2.36E+04	6.96E+03	4.34E+04
987.6	41.0	7	1.34E+05	1.96E+05	2.38E+05	8.58E+04	2.68E+05	2.29E+05	1.36E+05	1.46E+05	1.17E+05	7.23E+04	1.68E+05
1673.9	36.1	13	3.12E+05	2.13E+05	4.31E+05	2.05E+05	6.91E+05	6.23E+05	1.24E+05	1.82E+05	1.86E+05	2.23E+05	1.39E+05
1482.8	40.5	6	8.28E+04	1.03E+05	1.66E+05	6.73E+04	1.88E+05	1.87E+05	4.92E+04	1.12E+05	4.49E+04	5.50E+04	8.71E+04
3018.5	61.4	9	6.49E+04	9.61E+04	1.89E+05	2.80E+04	1.68E+05	1.62E+05	1.54E+04	1.02E+05	3.02E+04	1.15E+04	1.16E+05
1173.6	34.2	50	1.98E+05	3.34E+05	4.82E+05	1.08E+05	3.36E+05	2.84E+05	2.69E+05	1.83E+05	1.72E+05	7.82E+04	1.83E+05
2869.4	42.9	3	9.37E+04	1.16E+05	1.50E+05	6.20E+04	1.45E+05	1.85E+05	1.93E+04	1.10E+05	3.06E+04	3.43E+04	1.26E+05
1351.7	45.7	21	1.72E+06	1.82E+06	1.89E+06	1.56E+06	2.53E+06	2.45E+06	9.92E+05	1.64E+06	1.10E+06	8.44E+05	1.36E+06
2812.4	60.9	22	2.25E+05	1.30E+05	5.28E+05	1.59E+05	5.85E+05	4.89E+05	2.86E+04	2.92E+05	5.10E+04	4.07E+04	1.05E+05
1424.7	29.6	55	1.19E+06	7.20E+05	1.02E+06	5.39E+05	1.17E+06	1.18E+06	5.57E+05	6.94E+05	4.24E+05	3.46E+05	6.98E+05
1194.5	17.5	3	1.38E+05	1.10E+05	1.47E+05	1.51E+02	2.81E+05	1.62E+03	1.25E+05	8.78E+04	2.13E+04	4.28E+04	5.07E+04
2626.4	50.6	12	1.28E+05	1.43E+05	2.06E+05	4.80E+04	2.77E+05	2.85E+05	4.15E+04	1.58E+05	5.31E+04	5.17E+04	1.62E+05
1404.7	23.3	63	5.18E+05	5.60E+05	7.77E+05	1.13E+04	6.59E+05	5.75E+05	5.07E+05	4.14E+05	2.71E+05	1.60E+05	3.09E+05
2750.5	62.0	12	1.03E+05	1.22E+05	2.64E+05	9.68E+04	1.02E+05	1.08E+05	2.89E+04	1.23E+05	3.49E+04	2.65E+04	5.66E+04
2202.1	43.9	11	1.48E+05	2.27E+05	2.61E+05	7.59E+04	3.08E+05	3.29E+05	1.30E+05	1.74E+05	1.22E+05	9.11E+04	1.62E+05
1723.8	38.3	17	2.03E+05	1.86E+05	2.13E+05	9.57E+04	2.34E+05	2.26E+05	1.58E+05	1.24E+05	7.62E+04	6.40E+04	1.25E+05
2280.0	51.6	23	1.71E+05	3.13E+05	2.48E+05	1.05E+05	5.00E+05	4.46E+05	1.31E+05	2.32E+05	1.14E+05	8.28E+04	1.64E+05
4069.9	56.9	20	6.86E+05	8.36E+05	1.10E+06	4.46E+05	1.24E+06	9.21E+05	1.09E+05	7.83E+05	3.38E+05	2.11E+05	6.43E+05
2025.1	49.0	17	2.64E+05	4.85E+05	6.17E+05	3.43E+05	3.70E+05	3.73E+05	5.43E+04	4.57E+05	1.65E+05	4.69E+04	3.54E+05
1343.6	26.7	26	4.13E+05	3.68E+05	5.13E+05	7.94E+02	4.47E+05	3.57E+05	3.50E+05	2.56E+05	2.75E+05	1.17E+05	2.28E+05
2802.4	46.2	198	1.21E+05	1.00E+05	3.13E+05	2.32E+05	3.80E+05	1.91E+05	5.17E+04	2.98E+05	6.85E+04	1.06E+05	1.94E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.87E+05	2.27E+05	2.85E+05	4.35E+05	3.04E+05	2.26E+05	0.72	6.10E-01	1.89E-01	0.96	6.34E-01	8.24E-01	2.06E+05	1.99E+05
2.50E+05	2.25E+05	2.75E+05	4.46E+05	3.87E+05	3.46E+05	0.76	6.24E-01	2.18E-01	0.96	6.41E-01	8.23E-01	2.24E+05	2.16E+05
2.19E+05	3.58E+05	2.98E+05	4.56E+05	3.83E+05	3.56E+05	0.75	4.24E-01	7.09E-02	0.96	4.01E-01	7.21E-01	2.58E+05	2.49E+05
4.74E+04	5.53E+04	8.02E+04	8.76E+04	6.74E+04	1.86E+05	0.78	8.31E-01	3.47E-01	0.96	8.71E-01	8.67E-01	5.56E+04	5.35E+04
9.15E+04	1.74E+05	1.41E+05	3.30E+05	3.16E+05	2.08E+05	0.75	9.05E-01	3.64E-01	0.96	9.54E-01	8.75E-01	1.35E+05	1.30E+05
3.68E+04	7.70E+04	8.25E+04	1.20E+05	1.21E+05	8.62E+04	0.76	7.08E-01	2.75E-01	0.96	8.44E-01	8.63E-01	6.75E+04	6.49E+04
1.44E+06	6.46E+06	1.27E+06	3.56E+06	4.84E+06	4.18E+06	0.73	8.37E-01	2.92E-01	0.96	1.00E+00	8.78E-01	2.74E+06	2.63E+06
2.51E+04	2.74E+04	5.96E+04	7.88E+04	4.87E+04	9.20E+04	0.72	1.05E+00	4.04E-01	0.96	1.20E+00	8.98E-01	3.54E+04	3.40E+04
1.03E+05	1.23E+05	1.01E+05	1.69E+05	1.56E+05	1.45E+05	0.75	4.80E-01	1.05E-01	0.96	4.42E-01	7.35E-01	9.95E+04	9.56E+04
2.58E+05	1.52E+05	1.52E+05	5.00E+05	2.93E+05	1.49E+05	0.71	8.14E-01	2.57E-01	0.96	8.98E-01	8.63E-01	1.82E+05	1.75E+05
7.42E+04	8.75E+04	4.86E+04	1.12E+05	8.70E+04	9.49E+04	0.73	5.57E-01	1.63E-01	0.96	5.69E-01	7.99E-01	6.24E+04	6.00E+04
4.35E+04	6.61E+04	4.95E+04	8.51E+04	1.24E+05	7.54E+04	0.75	9.13E-01	3.71E-01	0.96	1.01E+00	8.78E-01	5.32E+04	5.11E+04
2.16E+05	1.47E+05	1.71E+05	3.16E+05	2.88E+05	1.91E+05	0.75	6.12E-01	1.84E-01	0.96	6.51E-01	8.10E-01	1.52E+05	1.46E+05
4.58E+04	8.80E+04	2.91E+04	1.05E+05	9.84E+04	7.59E+04	0.74	7.60E-01	2.66E-01	0.96	8.59E-01	8.55E-01	5.70E+04	5.48E+04
8.96E+05	1.31E+06	1.01E+06	1.72E+06	1.89E+06	1.50E+06	0.75	4.44E-01	7.07E-02	0.96	3.68E-01	6.72E-01	1.01E+06	9.66E+05
8.06E+04	1.68E+05	2.19E+05	3.68E+05	4.30E+05	2.12E+05	0.73	1.05E+00	4.02E-01	0.96	1.19E+00	8.90E-01	1.50E+05	1.43E+05
4.75E+05	6.09E+05	5.02E+05	8.49E+05	7.32E+05	7.12E+05	0.74	4.71E-01	8.91E-02	0.96	4.11E-01	6.95E-01	4.73E+05	4.54E+05
3.59E+04	8.76E+04	4.60E+04	1.29E+05	1.16E+05	8.18E+04	0.73	9.86E-01	4.08E-01	0.96	1.06E+00	8.79E-01	5.58E+04	5.34E+04
5.42E+04	9.06E+04	8.56E+04	1.60E+05	1.43E+05	1.32E+05	0.74	7.68E-01	2.90E-01	0.96	7.94E-01	8.31E-01	8.33E+04	7.96E+04
2.03E+05	3.98E+05	2.94E+05	5.60E+05	4.77E+05	5.03E+05	0.76	6.63E-01	2.31E-01	0.96	6.60E-01	7.93E-01	2.76E+05	2.63E+05
4.75E+04	4.46E+04	8.90E+04	1.72E+05	1.14E+05	1.15E+05	0.76	9.16E-01	3.73E-01	0.96	1.01E+00	8.62E-01	6.22E+04	5.94E+04
1.20E+05	1.13E+05	1.55E+05	2.26E+05	1.69E+05	1.29E+05	0.74	5.45E-01	1.45E-01	0.95	5.46E-01	7.52E-01	1.13E+05	1.08E+05
8.84E+04	1.08E+05	1.05E+05	1.84E+05	1.36E+05	1.83E+05	0.74	5.09E-01	9.41E-02	0.95	4.38E-01	6.77E-01	9.52E+04	9.08E+04
1.24E+05	1.70E+05	1.59E+05	3.16E+05	2.54E+05	2.09E+05	0.74	7.14E-01	2.46E-01	0.95	7.02E-01	7.83E-01	1.42E+05	1.34E+05
4.37E+05	3.94E+05	4.02E+05	8.17E+05	7.00E+05	6.83E+05	0.75	6.65E-01	2.21E-01	0.95	6.73E-01	7.70E-01	4.10E+05	3.89E+05
2.09E+05	1.46E+05	2.05E+05	4.90E+05	3.19E+05	3.83E+05	0.77	7.90E-01	3.19E-01	0.95	8.95E-01	8.20E-01	2.03E+05	1.93E+05
2.58E+05	2.20E+05	2.01E+05	3.77E+05	2.81E+05	3.26E+05	0.76	5.78E-01	1.81E-01	0.95	6.19E-01	7.47E-01	1.95E+05	1.85E+05
7.35E+04	2.42E+05	1.41E+05	8.77E+04	8.33E+04	1.72E+05	0.70	7.36E-01	2.21E-01	0.95	9.77E-01	8.32E-01	1.10E+05	1.04E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568954605	Macrophage scavenger receptor 1	3	FQNFSMATDQR	Deamidated(3)Oxidation(6)	2.69	2	681.3
157057166	Toll-like receptor 9	5	VTPGALLGLSNLTHLSLK	Deamidated(11)	3.71	3	612.4
37674242	Bone marrow stromal antigen 2	2	TQDSSLQAETQANSCNLTVVTLQESLEK	Carbamidomethyl(15)Deamidated(16)	6.64	3	1041.2
568991301	Plexin B2	10	SINVTGQGFSLIQK	Deamidated(3)	3.72	2	746.9
13173473	Major prion protein	2	YPNQVYYRPVDQYSNQNNFVHDCVNITIK	Carbamidomethyl(23)Deamidated(17)	8.31	4	898.2
568941322	Tapasin-related protein	1	AGNASLTLPLNLTLLK	Deamidated(3)	3.26	2	707.4
208609939	Receptor-type tyrosine phosphatase	2	GPDGTEGLSSTVNGSTDPSAVTDIR	Deamidated(13)	5.63	3	812.0
568935338	Iduronidase	2	FQVNNTHPPHVQLLR	Deamidated(4)	3.72	4	451.0
148747408	Laminin subunit alpha-4	7	RPASNISASIQR	Deamidated(5)	4.46	3	434.2
153791270	Laminin subunit gamma-1	12	VNSSLHSQISR	Deamidated(2)	3.9	2	614.8
9790019	Acid ceramidase	2	SVLENTTSYEEAKNTLTK	Deamidated(5)Deamidated(14)	3.92	3	677.3
84042523	Lysosomal protective protein	3	MYVTNDTEVAENNYEALK	Deamidated(5)Deamidated(12)Oxidation(1)	5.03	2	1061.0
153791389	Integrin alpha-1	13	GELQSENSSLTLSSSNR	Deamidated(7)	4.79	2	905.4
568994656	Leukocyte surface antigen CD47	3	SYIFIYDGNKNSTTTDQNFSAK	Deamidated(11)Deamidated(18)	7.43	3	873.1
568958972	Neural cell adhesion molecule 1	2	IYNTPSASYLEVTPDSENDGNYNCTAVNR	Carbamidomethyl(25)Deamidated(24)	6.32	3	1138.2
115292433	Heparan-alpha-glucosaminidase N-acetyltransferase	1	FGEFGNYLLVQHASSGANK	Deamidated(6)	6.16	3	709.7
84781760	P2X purinoceptor 7	2	GIAEVTENVTEGGVTK	Deamidated(8)	4.62	2	802.9
168693641	SUN domain-containing protein 2	1	ALSPNSTISSAPK	Deamidated(5)	3.39	2	637.3
10946646	Integrin alpha-X	1	YLNFTSEK	Deamidated(3)	2.59	2	545.3
755498552	Lysosomal acid phosphatase	1	YHGFLNTSYHR	Deamidated(6)	2.8	2	698.3
31791059	CD166 antigen	3	IIISPEENVTLTCTAENQLER	Carbamidomethyl(13)Deamidated(8)	3.45	3	811.1
568986527	Bone morphogenetic protein 1	1	IILNFTSMDLYR	Deamidated(4)Oxidation(8)	2.66	2	751.9
240255600	Von Willebrand factor A domain-containing protein 1	1	VEVPAGQNSTTVQGLTPCTTYLVTVTAAFR	Carbamidomethyl(18)Deamidated(8)	5.81	3	1061.5
568991244	Collagen alpha-1(XIV) chain	4	AIIQGLLPEQNYTVQLIAYYK	Deamidated(11)	3.23	2	1220.2
226437629	Embigin	4	DDEPLETTGDFNTTK	Deamidated(12)	3.94	2	842.4
6754900	5'-nucleotidase	3	VEFDDKGNVITSYGNPILLNSSIPEDATIK	Deamidated(20)	7.79	3	1084.2
568926396	Tenascin	12	YRLNYSLPTGQSMEVQLPK	Deamidated(4)Oxidation(13)	3.92	3	747.7
755526718	Piezo-type mechanosensitive ion channel component 1	1	QELYNGTADITLR	Deamidated(5)	3.81	2	747.9
6679389	Plexin-A1	2	YNYTEDPTILR	Deamidated(2)	2.82	2	693.3

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1361.6	28.5	29	7.49E+05	9.92E+05	1.09E+06	4.43E+05	1.19E+06	1.03E+06	1.01E+06	6.23E+05	4.37E+05	2.74E+05	5.65E+05
1835.1	57.0	10	1.64E+05	1.94E+05	3.13E+05	1.07E+05	3.46E+05	2.46E+05	5.03E+04	2.23E+05	4.69E+04	2.92E+04	2.59E+05
3121.5	56.7	20	3.10E+05	3.85E+05	5.11E+05	1.88E+05	5.68E+05	4.89E+05	5.79E+04	2.72E+05	8.62E+04	6.30E+04	4.71E+05
1492.8	46.1	16	5.46E+05	8.70E+05	1.16E+06	3.12E+05	1.20E+06	1.13E+06	4.62E+05	6.18E+05	3.16E+05	2.84E+05	6.87E+05
3589.7	41.8	10	1.33E+05	1.46E+05	3.28E+05	8.12E+04	2.78E+05	3.14E+05	8.47E+04	1.13E+05	7.18E+04	1.19E+05	1.26E+05
1413.8	49.2	14	1.19E+05	1.10E+05	1.93E+05	7.18E+04	2.19E+05	2.38E+05	9.86E+04	1.68E+05	6.57E+04	6.85E+04	1.55E+05
2434.1	40.9	11	1.13E+05	1.04E+05	1.26E+05	7.25E+04	1.62E+05	1.26E+05	5.60E+04	7.14E+04	5.21E+04	2.73E+04	7.09E+04
1800.9	34.0	14	1.16E+05	1.15E+05	2.11E+05	6.92E+04	2.64E+05	2.55E+05	1.00E+05	1.13E+05	8.27E+04	7.40E+04	1.19E+05
1300.7	23.3	26	6.15E+05	5.21E+05	1.00E+06	0.00E+00	1.58E+06	1.39E+06	9.07E+05	6.02E+05	3.01E+05	3.30E+05	6.14E+05
1228.6	20.6	69	4.23E+06	3.25E+06	5.55E+06	0.00E+00	9.15E+06	7.72E+06	5.21E+06	3.49E+06	1.67E+06	1.90E+06	3.34E+06
2030.0	31.3	1	2.15E+05	1.69E+05	2.90E+05	1.16E+05	3.36E+05	2.93E+05	8.98E+04	1.77E+05	1.09E+05	1.00E+05	8.86E+04
2120.9	37.2	42	2.79E+05	3.35E+05	2.33E+05	1.59E+05	4.78E+05	5.04E+05	2.47E+05	2.43E+05	4.11E+05	1.78E+05	2.39E+05
1809.8	31.8	32	7.86E+05	9.08E+05	1.19E+06	4.54E+05	1.28E+06	1.07E+06	6.26E+05	6.30E+05	3.88E+05	3.28E+05	6.67E+05
2617.2	41.7	60	1.68E+06	1.84E+06	2.43E+06	1.18E+06	3.51E+06	3.18E+06	1.12E+06	2.29E+06	9.88E+05	8.73E+05	2.18E+06
3412.5	49.0	11	1.48E+05	3.21E+05	3.90E+05	2.04E+05	2.65E+05	2.60E+05	1.40E+05	2.08E+05	2.33E+05	1.13E+05	1.78E+05
2127.0	45.2	12	4.04E+05	4.71E+05	6.75E+05	2.64E+05	6.50E+05	5.76E+05	2.59E+05	4.72E+05	2.75E+05	1.90E+05	4.18E+05
1604.8	38.3	17	3.88E+05	4.60E+05	5.32E+05	2.21E+05	4.47E+05	4.24E+05	3.07E+05	3.15E+05	1.97E+05	1.48E+05	3.14E+05
1273.7	28.4	41	2.09E+06	1.75E+06	2.79E+06	1.05E+06	4.51E+06	3.82E+06	1.81E+06	2.08E+06	1.24E+06	1.03E+06	1.86E+06
1089.5	31.7	2	7.75E+04	9.54E+04	1.26E+05	3.35E+04	1.56E+05	1.52E+05	6.68E+04	8.95E+04	3.64E+04	4.45E+04	7.48E+04
1395.6	27.9	16	2.91E+05	2.46E+05	3.42E+05	4.62E+02	4.33E+05	3.29E+05	2.11E+05	1.99E+05	1.28E+05	1.04E+05	1.98E+05
2431.2	49.8	13	1.78E+05	1.62E+05	3.72E+05	2.52E+05	6.31E+05	7.46E+05	1.17E+05	4.48E+05	1.55E+05	1.87E+05	2.88E+05
1502.8	52.4	24	1.10E+06	2.03E+06	2.82E+06	1.39E+06	2.12E+06	1.94E+06	3.90E+05	1.68E+06	1.07E+06	5.17E+05	1.64E+06
3182.6	62.7	15	7.07E+04	8.45E+04	1.84E+05	6.24E+04	1.60E+05	1.27E+05	1.43E+04	6.85E+04	3.94E+04	2.46E+04	9.22E+04
2439.3	63.3	25	2.36E+05	2.81E+05	7.14E+05	2.71E+05	4.95E+05	2.99E+05	9.05E+04	5.39E+05	8.95E+04	4.30E+04	1.34E+05
1683.7	37.2	9	7.59E+04	1.13E+05	1.05E+05	6.47E+04	9.14E+04	9.88E+04	1.23E+05	1.02E+05	1.06E+05	2.51E+04	3.64E+04
3250.6	54.8	16	4.35E+05	5.91E+05	1.30E+06	5.89E+05	1.33E+06	1.22E+06	1.77E+05	9.30E+05	6.81E+05	3.25E+05	1.11E+06
2241.1	42.2	4	9.36E+04	2.56E+04	6.25E+04	1.02E+05	1.83E+05	1.60E+05	2.52E+03	6.80E+04	4.93E+04	7.22E+04	2.00E+04
1494.7	40.2	6	6.78E+05	9.04E+05	7.42E+05	2.11E+05	8.88E+05	8.01E+05	4.88E+05	4.10E+05	1.66E+05	2.02E+05	4.09E+05
1385.7	39.1	13	1.69E+05	1.99E+05	2.39E+05	1.25E+05	2.06E+05	1.95E+05	1.46E+05	1.40E+05	1.19E+05	6.92E+04	1.35E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
6.64E+05	4.44E+05	5.11E+05	1.02E+06	7.86E+05	6.66E+05	0.73	5.16E-01	9.06E-02	0.95	5.06E-01	6.82E-01	4.79E+05	4.53E+05
6.32E+04	1.17E+05	1.16E+05	1.77E+05	1.86E+05	1.60E+05	0.74	8.09E-01	2.82E-01	0.95	9.20E-01	8.20E-01	1.05E+05	9.94E+04
1.41E+05	1.95E+05	1.68E+05	2.31E+05	2.40E+05	3.38E+05	0.72	8.15E-01	2.67E-01	0.95	9.19E-01	8.18E-01	1.77E+05	1.67E+05
3.80E+05	4.99E+05	4.27E+05	6.98E+05	6.41E+05	6.52E+05	0.73	5.73E-01	1.58E-01	0.95	5.40E-01	7.10E-01	4.14E+05	3.91E+05
7.74E+04	9.74E+04	9.61E+04	2.10E+05	1.02E+05	1.37E+05	0.70	6.62E-01	2.01E-01	0.95	7.15E-01	7.72E-01	9.52E+04	9.00E+04
5.68E+04	9.81E+04	1.01E+05	1.12E+05	1.25E+05	1.15E+05	0.73	5.46E-01	1.34E-01	0.95	5.67E-01	7.14E-01	8.12E+04	7.67E+04
6.70E+04	7.04E+04	5.82E+04	1.07E+05	9.37E+04	7.69E+04	0.73	5.18E-01	9.71E-02	0.94	4.78E-01	6.48E-01	5.55E+04	5.24E+04
8.25E+04	8.60E+04	1.09E+05	1.35E+05	1.13E+05	1.22E+05	0.71	5.09E-01	1.37E-01	0.94	4.52E-01	6.63E-01	8.28E+04	7.81E+04
4.44E+05	5.08E+05	4.77E+05	8.10E+05	5.42E+05	5.79E+05	0.70	6.42E-01	2.20E-01	0.94	6.43E-01	7.50E-01	4.24E+05	3.99E+05
2.75E+06	2.99E+06	2.48E+06	4.67E+06	3.38E+06	3.62E+06	0.70	6.31E-01	2.10E-01	0.94	6.18E-01	7.39E-01	2.47E+06	2.33E+06
1.49E+05	1.07E+05	1.38E+05	2.37E+05	2.08E+05	1.17E+05	0.72	5.91E-01	1.35E-01	0.94	6.03E-01	7.02E-01	1.13E+05	1.06E+05
2.01E+05	2.96E+05	1.43E+05	3.50E+05	2.56E+05	3.13E+05	0.77	5.07E-01	1.39E-01	0.94	6.73E-01	7.50E-01	1.95E+05	1.83E+05
4.79E+05	5.56E+05	5.43E+05	8.20E+05	7.16E+05	5.74E+05	0.72	4.67E-01	7.86E-02	0.94	4.14E-01	5.89E-01	4.61E+05	4.33E+05
9.87E+05	1.26E+06	1.42E+06	1.67E+06	1.82E+06	1.54E+06	0.73	5.37E-01	1.26E-01	0.94	5.35E-01	6.73E-01	1.15E+06	1.08E+06
6.92E+04	1.61E+05	1.80E+05	2.66E+05	3.36E+05	1.96E+05	0.78	6.03E-01	1.97E-01	0.94	6.78E-01	7.29E-01	1.44E+05	1.35E+05
2.96E+05	2.94E+05	2.64E+05	4.70E+05	3.75E+05	3.36E+05	0.73	4.64E-01	8.04E-02	0.94	4.66E-01	6.25E-01	2.60E+05	2.45E+05
1.81E+05	2.62E+05	2.63E+05	3.39E+05	3.16E+05	3.26E+05	0.73	4.20E-01	5.02E-02	0.94	3.89E-01	5.49E-01	2.11E+05	1.98E+05
1.44E+06	1.39E+06	1.64E+06	2.33E+06	2.10E+06	1.59E+06	0.71	5.27E-01	1.31E-01	0.94	4.74E-01	6.36E-01	1.32E+06	1.24E+06
3.27E+04	7.66E+04	5.71E+04	7.43E+04	9.03E+04	8.12E+04	0.72	5.63E-01	1.42E-01	0.94	5.47E-01	6.72E-01	5.21E+04	4.88E+04
1.31E+05	1.77E+05	1.54E+05	2.33E+05	1.94E+05	2.02E+05	0.72	5.54E-01	1.64E-01	0.94	5.16E-01	6.69E-01	1.38E+05	1.29E+05
2.24E+05	1.50E+05	1.63E+05	3.68E+05	2.68E+05	2.89E+05	0.71	6.94E-01	2.49E-01	0.94	7.54E-01	7.62E-01	1.92E+05	1.79E+05
1.60E+06	1.04E+06	7.57E+05	1.32E+06	1.30E+06	1.27E+06	0.73	5.65E-01	1.39E-01	0.94	7.01E-01	7.20E-01	9.42E+05	8.81E+05
4.52E+04	5.10E+04	4.67E+04	9.03E+04	8.92E+04	7.86E+04	0.72	7.34E-01	2.47E-01	0.93	7.45E-01	7.42E-01	5.01E+04	4.69E+04
9.50E+04	1.41E+05	1.89E+05	4.46E+05	5.80E+05	4.45E+05	0.77	1.08E+00	4.56E-01	0.93	1.21E+00	8.33E-01	1.91E+05	1.79E+05
4.81E+04	6.68E+04	8.34E+04	1.39E+05	1.25E+05	9.60E+04	0.79	5.69E-01	2.31E-01	0.93	7.63E-01	7.38E-01	5.98E+04	5.59E+04
2.95E+05	4.30E+05	4.47E+05	6.54E+05	9.77E+05	6.39E+05	0.76	7.56E-01	2.74E-01	0.93	8.19E-01	7.55E-01	4.72E+05	4.41E+05
6.94E+04	4.76E+04	1.99E+04	8.19E+04	1.31E+05	1.34E+04	0.69	9.71E-01	3.00E-01	0.93	1.13E+00	8.19E-01	4.60E+04	4.30E+04
3.08E+05	3.81E+05	2.92E+05	7.80E+05	5.33E+05	4.68E+05	0.72	6.46E-01	1.64E-01	0.93	6.84E-01	7.07E-01	3.29E+05	3.07E+05
1.33E+05	1.05E+05	9.31E+04	1.63E+05	1.82E+05	1.24E+05	0.73	3.91E-01	2.97E-02	0.93	3.94E-01	5.10E-01	9.95E+04	9.28E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568974274	GPI transamidase component PIG-S	1	IYNASELPVR	Deamidated(3)	2.76	2	581.8
6680878	Lysosome membrane protein 2	7	TMVFPVMYLNESVLIDK	Deamidated(10)Oxidation(2)Oxidation(7)	4.94	3	678.0
569000449	Latent-transforming growth factor beta-binding protein 1	2	GNTTTLISENGHAADTLTATNFR	Deamidated(2)	7.18	3	803.1
568915917	Tyrosine-protein phosphatase non-receptor type substrate 1	5	VTQQSPTSMNQVNLTCR	Carbamidomethyl(16)Deamidated(13)Oxidation(9)	3.53	2	991.0
31542362	ADP-ribosyl cyclase 1	3	NSTFGSVEVFSLDPNK	Deamidated(1)	4.21	2	871.4
6677905	Golgi apparatus protein 1	3	LNLTTDPK	Deamidated(2)	2.81	2	451.7
568990242	Oncostatin M receptor	3	ITANNSMGASPESLMVLNSDSGHEVVK	Deamidated(4)Deamidated(19)Oxidation(7)Oxidation(15)	3.13	3	951.1
112293269	Integrin alpha 7	3	ALDSVEKPLCLSNDASASHVECELGNPMK	Carbamidomethyl(10)Carbamidomethyl(21)Deamidated(13)Oxidation(27)	4.79	3	1039.8
153792211	Ectonucleotide pyrophosphatase/phosphodiesterase family member 1	3	MNASFSLK	Deamidated(2)Oxidation(1)	2.54	2	457.7
146231960	Chondroitin sulfate proteoglycan 4	2	YVHDGSETQTDAFVLLANASEMDR	Deamidated(18)Oxidation(22)	6.7	3	896.1
47087146	All-trans retinoic acid-induced differentiation factor isoform 1	1	GTILGLDLQNCCLK	Carbamidomethyl(11)Deamidated(10)	3.9	2	766.9
568971832	Integrin alpha-3	2	DLAVGDDYTNR	Deamidated(10)	2.63	2	620.3
13384938	Endoplasmic reticulum-Golgi intermediate compartment protein 3	2	HLSFGEDYPGIVNPLDHTNVTAPQASMMFQYFVK	Deamidated(13)Deamidated(19)Oxidation(27)Oxidation(28)	8.34	4	972.5
227330580	Platelet receptor Gi24 isoform 1	2	VTPYSLYVCPEGQNALTCR	Carbamidomethyl(10)Carbamidomethyl(20)Deamidated(15)	4.69	3	811.0
224967112	coagulation factor XIII B chain	2	TYENGSSVEYR	Deamidated(4)	2.99	2	653.3
22094083	CD48 antigen	4	ILEYNYNSTK	Deamidated(7)	2.47	2	623.3
568920948	Protocadherin Fat 4	3	INATTGEIFNK	Deamidated(2)	3.68	2	604.8
153791389	Integrin alpha-1	13	AHFSSLNLTIR	Deamidated(7)	3.17	3	420.6
569004755	Nucleotide exchange factor SIL1	1	FNSSSSSLEEK	Deamidated(2)	2.88	2	608.3
84042523	Lysosomal protective protein	3	MYVTNDTEVAENNYEALKDFFR	Deamidated(5)Deamidated(12)Oxidation(1)	6.2	3	896.4
225735655	prosaposin	7	TNSSFIQGFVDHVKEDCDR	Carbamidomethyl(17)Deamidated(2)	6.94	3	752.3
568990242	Oncostatin M receptor	3	ITANNSMGASPESLMVLNSDSGHEVKEK	Deamidated(5)Deamidated(19)Oxidation(7)Oxidation(15)	3.35	4	777.9
568956330	Neuropilin-1	2	RGPECSQNYTAPTGVK	Carbamidomethyl(5)Deamidated(8)	4.64	3	627.0
22203763	Carboxypeptidase E	1	DLQGNPIANATISVDGIDHDVTSK	Deamidated(9)	5.51	3	851.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1162.6	35.6	14	9.56E+05	1.19E+06	1.68E+06	8.32E+05	1.76E+06	1.50E+06	8.50E+05	8.83E+05	5.23E+05	5.21E+05	8.64E+05
2032.0	58.5	62	1.30E+06	2.81E+06	3.44E+06	8.68E+05	4.17E+06	3.65E+06	8.13E+05	2.79E+06	1.13E+06	6.28E+05	2.92E+06
2407.1	41.1	78	1.45E+05	1.08E+05	6.15E+04	1.25E+05	1.92E+05	1.58E+05	4.83E+04	1.22E+05	3.88E+04	6.73E+04	1.41E+05
1980.9	27.0	22	2.40E+05	1.95E+05	2.84E+05	6.34E+03	2.86E+05	2.53E+05	1.93E+05	1.43E+05	9.12E+04	5.18E+04	1.84E+05
1741.8	55.8	14	4.66E+05	4.40E+05	6.35E+05	2.34E+05	6.19E+05	6.34E+05	2.89E+05	4.87E+05	3.91E+05	2.02E+05	4.21E+05
902.5	28.3	15	1.91E+06	1.79E+06	2.40E+06	1.07E+06	2.48E+06	2.11E+06	1.21E+06	1.51E+06	8.34E+05	6.28E+05	1.42E+06
2851.3	36.2	13	2.22E+05	5.50E+05	2.93E+05	1.22E+05	3.97E+05	3.18E+05	1.63E+05	3.37E+05	2.02E+05	2.05E+05	1.42E+05
3117.4	39.3	23	1.71E+05	1.71E+05	5.02E+05	8.25E+04	4.78E+05	4.05E+05	1.17E+05	1.66E+05	8.43E+04	8.46E+04	3.07E+05
914.4	28.7	7	6.99E+05	8.35E+05	9.85E+05	4.35E+05	8.68E+05	8.94E+05	4.60E+05	6.80E+05	2.95E+05	1.93E+05	5.81E+05
2686.2	48.8	18	4.65E+05	5.96E+05	7.61E+05	4.04E+05	1.01E+06	9.38E+05	2.22E+05	5.11E+05	4.34E+05	2.14E+05	5.14E+05
1532.8	50.8	5	7.02E+04	9.94E+04	1.56E+05	3.77E+04	1.81E+05	1.68E+05	5.84E+04	1.20E+05	4.59E+04	3.82E+04	1.26E+05
1239.5	30.9	3	7.14E+04	7.09E+04	3.75E+04	7.02E+04	1.61E+05	1.30E+05	9.91E+04	7.60E+04	6.04E+04	3.49E+04	5.59E+04
3886.8	54.2	20	7.78E+05	9.22E+05	1.33E+06	4.63E+05	1.31E+06	1.25E+06	6.84E+04	9.61E+05	4.10E+05	2.97E+05	7.68E+05
2431.1	46.0	1	8.57E+04	8.75E+04	1.35E+05	3.03E+04	1.02E+05	1.61E+05	3.56E+04	1.00E+05	3.38E+04	1.84E+04	1.13E+05
1305.6	23.5	17	3.28E+05	4.11E+05	4.93E+05	8.36E+03	7.52E+05	6.62E+05	3.90E+05	3.64E+05	1.86E+05	1.95E+05	2.80E+05
1245.6	30.6	7	9.66E+05	9.06E+05	1.02E+06	4.95E+05	1.02E+06	9.00E+05	6.94E+05	6.21E+05	3.85E+05	2.80E+05	5.62E+05
1208.6	34.8	8	6.38E+04	7.88E+04	1.02E+05	4.26E+04	1.28E+05	1.16E+05	4.95E+04	1.67E+05	4.02E+04	4.49E+04	1.12E+05
1259.7	37.4	14	2.88E+05	4.89E+05	6.45E+05	1.85E+05	6.57E+05	6.19E+05	1.68E+05	2.89E+05	1.74E+05	1.13E+05	3.95E+05
1215.5	21.5	2	1.32E+05	8.73E+04	1.22E+05	3.80E+04	2.55E+05	1.99E+05	1.05E+05	1.11E+05	5.03E+04	4.76E+04	9.96E+04
2687.2	53.1	39	1.03E+05	2.11E+05	3.34E+05	1.04E+05	2.63E+05	2.33E+05	4.43E+04	9.98E+04	1.39E+05	4.67E+04	1.08E+05
2255.0	44.9	25	5.44E+05	4.57E+05	1.05E+06	9.13E+04	1.27E+06	1.50E+06	2.36E+05	4.80E+05	2.09E+05	2.33E+05	5.43E+05
3108.4	32.5	5	9.41E+04	9.21E+04	1.21E+05	5.38E+04	1.82E+05	1.38E+05	6.25E+04	8.80E+04	4.38E+04	3.88E+04	6.20E+04
1878.9	27.0	15	2.41E+05	2.32E+05	3.57E+05	1.14E+05	4.97E+05	3.73E+05	2.41E+05	1.64E+05	1.21E+05	9.27E+04	2.35E+05
2552.2	50.8	7	3.82E+05	1.63E+05	7.21E+05	2.03E+05	9.01E+05	7.08E+05	7.86E+04	3.00E+05	2.19E+05	2.25E+05	3.68E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
5.04E+05	7.25E+05	8.09E+05	1.15E+06	1.01E+06	8.61E+05	0.71	4.65E-01	6.80E-02	0.93	3.89E-01	5.08E-01	6.37E+05	5.94E+05
1.16E+06	1.67E+06	1.24E+06	1.90E+06	2.02E+06	2.07E+06	0.73	7.10E-01	2.33E-01	0.93	7.76E-01	7.30E-01	1.34E+06	1.24E+06
8.38E+04	6.12E+04	4.98E+04	6.54E+04	7.64E+04	6.94E+04	0.69	5.78E-01	1.13E-01	0.93	7.01E-01	6.98E-01	6.25E+04	5.81E+04
7.28E+04	1.47E+05	1.10E+05	1.60E+05	1.68E+05	2.00E+05	0.73	6.47E-01	1.85E-01	0.93	6.46E-01	6.73E-01	1.07E+05	9.92E+04
3.61E+05	3.05E+05	3.45E+05	4.76E+05	3.08E+05	3.08E+05	0.73	4.07E-01	4.67E-02	0.93	5.14E-01	5.98E-01	2.76E+05	2.56E+05
9.08E+05	1.08E+06	1.20E+06	1.58E+06	1.65E+06	1.33E+06	0.72	4.51E-01	5.86E-02	0.93	3.91E-01	4.89E-01	9.69E+05	9.00E+05
3.29E+05	2.04E+05	1.51E+05	2.45E+05	2.26E+05	1.58E+05	0.72	5.39E-01	1.23E-01	0.93	8.26E-01	7.36E-01	1.73E+05	1.60E+05
9.55E+04	1.41E+05	1.45E+05	1.60E+05	1.96E+05	2.06E+05	0.69	7.78E-01	2.53E-01	0.93	8.54E-01	7.44E-01	1.32E+05	1.22E+05
2.73E+05	5.14E+05	3.92E+05	6.19E+05	8.16E+05	6.23E+05	0.73	5.55E-01	1.11E-01	0.93	5.47E-01	5.97E-01	3.91E+05	3.62E+05
2.89E+05	4.18E+05	4.53E+05	6.05E+05	5.10E+05	4.30E+05	0.72	5.30E-01	1.18E-01	0.92	5.25E-01	5.92E-01	3.42E+05	3.16E+05
4.90E+04	6.55E+04	6.84E+04	6.81E+04	8.03E+04	9.92E+04	0.71	6.42E-01	1.76E-01	0.92	6.87E-01	6.77E-01	5.91E+04	5.46E+04
4.97E+04	3.75E+04	6.57E+04	1.09E+05	7.66E+04	6.94E+04	0.72	5.95E-01	1.39E-01	0.92	5.73E-01	6.11E-01	4.95E+04	4.57E+04
3.86E+05	5.45E+05	5.01E+05	8.84E+05	8.18E+05	6.34E+05	0.73	6.39E-01	1.94E-01	0.92	6.54E-01	6.72E-01	4.77E+05	4.41E+05
1.98E+04	3.63E+04	6.98E+04	9.64E+04	6.63E+04	8.47E+04	0.74	8.06E-01	2.70E-01	0.92	9.09E-01	7.42E-01	4.90E+04	4.52E+04
2.83E+05	2.91E+05	2.63E+05	3.27E+05	2.68E+05	3.02E+05	0.69	4.87E-01	1.43E-01	0.92	5.31E-01	6.26E-01	2.26E+05	2.08E+05
3.42E+05	6.12E+05	4.76E+05	8.65E+05	6.36E+05	7.13E+05	0.72	4.66E-01	5.38E-02	0.92	4.31E-01	4.83E-01	4.45E+05	4.10E+05
4.16E+04	5.53E+04	3.66E+04	5.12E+04	9.43E+04	8.38E+04	0.74	6.92E-01	2.23E-01	0.92	8.60E-01	7.32E-01	5.17E+04	4.76E+04
2.26E+05	2.13E+05	2.44E+05	3.74E+05	3.36E+05	3.02E+05	0.71	6.23E-01	1.67E-01	0.92	6.36E-01	6.42E-01	2.19E+05	2.02E+05
5.23E+04	7.10E+04	8.13E+04	1.20E+05	1.08E+05	1.06E+05	0.70	6.13E-01	1.69E-01	0.92	5.58E-01	6.10E-01	6.80E+04	6.26E+04
9.32E+04	1.31E+05	1.15E+05	1.99E+05	1.17E+05	1.77E+05	0.73	6.83E-01	2.15E-01	0.92	7.33E-01	6.84E-01	9.82E+04	9.03E+04
3.46E+05	4.26E+05	3.27E+05	6.40E+05	5.19E+05	5.15E+05	0.68	7.37E-01	2.67E-01	0.92	7.72E-01	7.27E-01	3.54E+05	3.26E+05
5.66E+04	5.68E+04	6.46E+04	9.55E+04	9.32E+04	7.84E+04	0.70	5.18E-01	1.00E-01	0.92	4.45E-01	5.10E-01	5.47E+04	5.03E+04
1.29E+05	1.62E+05	1.61E+05	2.17E+05	2.08E+05	2.43E+05	0.70	5.47E-01	1.17E-01	0.92	4.74E-01	5.31E-01	1.44E+05	1.33E+05
2.85E+05	1.63E+05	2.96E+05	3.64E+05	3.49E+05	1.44E+05	0.67	6.99E-01	2.22E-01	0.92	8.01E-01	7.10E-01	2.25E+05	2.07E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568936922	P2X purinoceptor 4	4	GVAVTNTSQLGFR	Deamidated(6)	3.65	2	675.9
568936922	P2X purinoceptor 4	4	NILPNITTSYLK	Deamidated(5)	2.96	2	689.4
6679641	Emerin	1	LIYQQDSAYQSIHYRPI SNVSR	Deamidated(20)	4.16	4	660.6
568991610	Alpha-N-acetylgalactosaminidase	1	VNYTEVSR	Deamidated(2)	2.47	2	484.7
84781760	P2X purinoceptor 7	2	SAENFTVLIK	Deamidated(4)	2.85	2	561.8
569003275	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 1	1	INQFNLMASEMIALNR	Deamidated(15)Oxidation(7)Oxidation(11)	2.51	2	949.5
569017350	Endoplasmic reticulum-Golgi intermediate compartment protein 2	1	GHAHLAALVNHDSYNFSHR	Deamidated(15)	6.07	4	537.5
47271511	Transforming growth factor beta receptor type 3	1	AGVVVFNC SLR	Carbamidomethyl(8)Deamidated(7)	2.67	2	611.8
568987063	stabilin-1	7	GDPFPTVFVPHADLISNMSQDELAR	Deamidated(17)Oxidation(18)	6.24	3	911.8
568959112	SID1 transmembrane family, member 2	2	TGELFTFN TAAQPQYFK	Deamidated(8)	5	2	1033.0
568913714	Angiopoietin-related protein 2	2	ILNQTADMLQLASK	Deamidated(3)Oxidation(8)	4.21	2	781.9
568920137	Laminin subunit alpha-5	15	QELSQDNATLK	Deamidated(7)	3.83	2	624.3
113195678	Lysosomal-associated membrane protein 1	7	AFNISPNDTSSGSCGINLVTLK	Carbamidomethyl(14)Deamidated(7)	6.04	3	766.0
226437659	Endoglin	3	VNITVLP SLTSR	Deamidated(2)	3.43	2	650.9
568926396	Tenascin	12	LLQTA EHNISGAER	Deamidated(8)	4.14	2	770.4
568938566	Solute carrier family 12 member 9	1	HGHFTGFNGSTLR	Deamidated(8)	3.14	2	716.3
6680878	Lysosome membrane protein	7	NQSVGDPNVDLIR	Deamidated(1)	2.46	2	714.4
568996676	Phospholipase A1 member A	1	SSEFNASLGTK	Deamidated(5)	2.97	2	571.3
568926396	Tenascin	12	LNYSLPTGQSMEVQLPK	Deamidated(2)Oxidation(11)	3.25	2	961.5
47523368	Prolyl 3-hydroxylase 3	2	LHEAYAQVGNMSQAMENVLSVLLFYPEDEAAKK	Deamidated(10)Oxidation(11)Oxidation(15)	6.04	4	932.9
90568038	ATP-binding cassette sub-family A member 1	3	YPTPGEAPGVVGNFNK	Deamidated(15)	4.07	2	824.4
755522060	Tripeptidyl-peptidase 1	2	SSSHLPPSSYFNASGR	Deamidated(12)	4.13	3	565.6
13173473	Major prion protein	2	GENFTETDVK	Deamidated(3)	2.52	2	570.8
23346525	CD109 antigen	3	IYELHINGQSENEIVFSNR	Deamidated(7)Deamidated(18)	5.81	3	755.4
568990229	Leukemia inhibitory factor receptor	3	LGVMHPGQEIHNFTLTGR	Deamidated(13)Oxidation(5)	3.66	3	718.0
755549025	Glycosyltransferase 8 domain-containing protein 1	2	SNVMFYIVTFNSTADHLR	Deamidated(11)Oxidation(4)	4.07	3	711.3
568976251	Microfibril-associated glycoprotein 4	2	FNGSVSFFR	Deamidated(2)	2.94	2	531.3

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1350.7	38.0	33	1.20E+06	1.21E+06	1.42E+06	6.53E+05	1.66E+06	1.54E+06	5.96E+05	9.99E+05	4.54E+05	4.07E+05	9.27E+05
1377.8	50.8	17	7.75E+05	8.01E+05	1.08E+06	3.49E+05	1.22E+06	1.20E+06	4.28E+05	8.17E+05	3.71E+05	3.16E+05	6.78E+05
2639.3	39.6	5	5.64E+04	4.60E+04	9.72E+04	3.76E+04	1.01E+05	7.79E+04	1.13E+04	8.49E+03	4.06E+04	5.70E+04	4.58E+04
968.5	22.6	5	2.34E+05	1.89E+05	2.61E+05	1.11E+04	4.19E+05	4.31E+05	2.89E+05	2.17E+05	1.88E+05	1.03E+05	1.79E+05
1122.6	44.6	12	2.55E+05	2.66E+05	3.99E+05	1.20E+05	3.52E+05	3.39E+05	1.59E+05	2.74E+05	9.99E+04	7.53E+04	2.64E+05
1897.9	45.6	1	1.16E+05	1.89E+05	2.29E+05	7.55E+04	1.96E+05	1.65E+05	4.21E+04	1.52E+05	1.34E+05	3.94E+04	1.51E+05
2147.0	28.1	38	2.66E+05	2.55E+05	3.40E+05	0.00E+00	4.51E+05	3.57E+05	1.38E+05	2.52E+05	1.19E+05	9.69E+04	1.98E+05
1222.6	41.6	1	9.23E+04	7.42E+04	1.23E+05	5.73E+04	1.58E+05	1.85E+05	3.99E+04	8.68E+04	5.87E+04	5.46E+04	1.13E+05
2733.3	54.4	18	8.37E+05	1.06E+06	1.44E+06	6.58E+05	1.94E+06	1.72E+06	4.85E+05	1.04E+06	7.41E+05	4.49E+05	8.73E+05
2065.0	53.2	17	2.56E+05	3.50E+05	4.07E+05	2.30E+05	4.69E+05	3.48E+05	1.46E+05	3.46E+05	1.72E+05	1.27E+05	2.63E+05
1562.8	38.4	28	9.49E+05	8.74E+05	1.48E+06	7.49E+05	2.19E+06	2.14E+06	5.38E+05	1.10E+06	4.99E+05	6.34E+05	9.08E+05
1247.6	24.8	16	8.45E+05	4.99E+05	8.72E+05	3.24E+04	1.73E+06	1.48E+06	6.27E+05	6.68E+05	3.36E+05	4.25E+05	6.01E+05
2296.1	51.2	107	1.99E+06	2.67E+06	3.72E+06	9.45E+05	4.14E+06	3.67E+06	1.92E+06	1.95E+06	1.11E+06	9.76E+05	2.28E+06
1300.7	49.4	19	1.98E+06	2.73E+06	3.21E+06	1.40E+06	3.44E+06	3.04E+06	1.05E+06	1.59E+06	1.13E+06	8.75E+05	1.66E+06
1539.8	27.1	87	1.28E+05	9.93E+04	2.00E+05	0.00E+00	2.31E+05	1.35E+05	6.75E+04	1.91E+05	7.63E+04	9.28E+04	1.01E+05
1431.7	27.1	6	1.56E+05	1.25E+05	2.09E+05	1.87E+03	2.56E+05	2.04E+05	1.14E+05	1.69E+05	7.34E+04	5.30E+04	1.18E+05
1427.7	39.7	19	9.10E+05	9.95E+05	1.38E+06	4.36E+05	1.57E+06	1.49E+06	7.40E+05	9.65E+05	4.80E+05	4.16E+05	7.33E+05
1141.5	29.7	3	1.10E+05	9.58E+04	1.65E+05	6.17E+04	2.02E+05	2.35E+05	9.62E+04	6.78E+04	4.50E+04	5.43E+04	6.26E+04
1922.0	44.3	73	7.50E+06	1.04E+07	1.78E+07	1.04E+07	1.75E+07	1.65E+07	4.42E+06	1.26E+07	5.09E+06	7.57E+06	1.03E+07
3728.8	55.8	9	1.76E+05	3.18E+05	3.87E+05	1.66E+05	4.63E+05	3.67E+05	4.79E+04	3.17E+05	1.57E+05	2.64E+04	2.75E+05
1647.8	39.1	12	8.37E+04	1.27E+05	1.56E+05	3.24E+04	1.88E+05	1.39E+05	9.03E+04	6.49E+04	3.65E+04	3.07E+04	6.04E+04
1694.8	30.6	174	6.81E+06	4.98E+06	7.46E+06	3.02E+06	1.17E+07	1.07E+07	4.27E+06	5.69E+06	2.98E+06	2.84E+06	4.67E+06
1140.5	26.1	16	1.16E+06	7.79E+05	1.51E+06	9.50E+02	2.15E+06	1.71E+06	1.24E+06	1.16E+06	6.01E+05	4.31E+05	1.03E+06
2264.1	45.4	11	1.93E+05	2.66E+05	4.02E+05	1.51E+05	2.94E+05	2.79E+05	5.43E+04	1.72E+05	8.29E+04	8.74E+04	1.64E+05
2152.1	34.1	21	5.13E+05	2.95E+05	3.37E+05	2.09E+05	9.35E+05	8.12E+05	3.87E+05	3.92E+05	2.84E+05	2.77E+05	3.96E+05
2132.0	50.9	30	2.85E+05	4.14E+05	5.37E+05	1.95E+05	4.71E+05	4.18E+05	7.23E+04	3.72E+05	1.28E+05	1.01E+05	3.18E+05
1061.5	44.2	47	3.53E+06	4.83E+06	7.55E+06	2.51E+06	1.18E+07	1.09E+07	3.36E+06	6.01E+06	2.33E+06	2.69E+06	3.93E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
4.07E+05	7.16E+05	5.43E+05	1.26E+06	9.46E+05	1.00E+06	0.72	5.74E-01	1.14E-01	0.92	5.46E-01	5.65E-01	6.12E+05	5.62E+05
3.02E+05	6.08E+05	4.59E+05	7.84E+05	7.10E+05	6.22E+05	0.71	5.44E-01	1.14E-01	0.92	5.33E-01	5.66E-01	4.47E+05	4.10E+05
2.95E+04	2.56E+04	1.94E+04	2.28E+04	6.26E+04	2.06E+04	0.67	7.51E-01	1.95E-01	0.92	9.76E-01	7.45E-01	2.95E+04	2.71E+04
1.13E+05	1.89E+05	1.72E+05	2.45E+05	1.94E+05	2.41E+05	0.72	5.76E-01	1.61E-01	0.92	5.57E-01	5.98E-01	1.44E+05	1.32E+05
9.57E+04	1.74E+05	1.60E+05	2.16E+05	2.09E+05	2.51E+05	0.72	5.74E-01	1.20E-01	0.92	5.97E-01	5.94E-01	1.43E+05	1.31E+05
7.64E+04	9.35E+04	1.04E+05	1.43E+05	1.50E+05	1.12E+05	0.75	5.83E-01	1.63E-01	0.92	6.61E-01	6.38E-01	8.65E+04	7.93E+04
1.27E+05	1.54E+05	1.41E+05	2.33E+05	2.31E+05	1.97E+05	0.71	6.11E-01	1.85E-01	0.91	5.76E-01	6.14E-01	1.38E+05	1.26E+05
5.74E+04	5.74E+04	5.52E+04	7.02E+04	8.05E+04	4.98E+04	0.69	5.62E-01	1.21E-01	0.91	6.04E-01	5.85E-01	5.53E+04	5.05E+04
7.78E+05	5.30E+05	5.97E+05	1.19E+06	9.70E+05	8.75E+05	0.71	5.46E-01	1.15E-01	0.91	5.31E-01	5.40E-01	6.33E+05	5.77E+05
1.68E+05	2.05E+05	1.67E+05	2.65E+05	2.91E+05	2.51E+05	0.72	4.51E-01	6.17E-02	0.91	4.26E-01	4.68E-01	1.75E+05	1.60E+05
5.51E+05	7.20E+05	6.70E+05	1.02E+06	1.02E+06	8.98E+05	0.69	5.28E-01	1.31E-01	0.91	4.65E-01	5.46E-01	6.51E+05	5.94E+05
3.75E+05	5.46E+05	4.63E+05	8.16E+05	5.94E+05	4.43E+05	0.68	6.36E-01	2.00E-01	0.91	6.56E-01	6.44E-01	4.36E+05	3.98E+05
1.19E+06	1.78E+06	1.31E+06	2.28E+06	2.03E+06	1.81E+06	0.70	5.31E-01	1.06E-01	0.91	5.01E-01	5.15E-01	1.38E+06	1.26E+06
1.36E+06	1.31E+06	1.32E+06	2.17E+06	1.83E+06	1.59E+06	0.70	4.81E-01	8.09E-02	0.91	4.47E-01	4.75E-01	1.23E+06	1.12E+06
8.86E+04	1.09E+05	6.66E+04	5.57E+04	8.10E+04	1.04E+05	0.70	5.59E-01	1.69E-01	0.91	7.60E-01	6.70E-01	7.36E+04	6.69E+04
6.18E+04	1.10E+05	9.23E+04	1.21E+05	1.52E+05	1.22E+05	0.71	6.06E-01	1.68E-01	0.91	5.96E-01	5.90E-01	8.35E+04	7.59E+04
4.33E+05	6.35E+05	5.08E+05	1.20E+06	1.11E+06	6.24E+05	0.71	5.95E-01	1.18E-01	0.91	5.63E-01	5.35E-01	5.67E+05	5.15E+05
8.14E+04	2.87E+04	5.75E+04	1.07E+05	1.01E+05	1.64E+05	0.69	7.28E-01	1.78E-01	0.91	7.36E-01	6.34E-01	6.57E+04	5.97E+04
6.70E+06	9.72E+06	4.07E+06	6.21E+06	8.83E+06	8.53E+06	0.68	4.90E-01	8.00E-02	0.91	5.88E-01	5.59E-01	6.43E+06	5.85E+06
1.16E+05	1.97E+05	1.56E+05	2.90E+05	2.36E+05	2.57E+05	0.73	7.08E-01	2.11E-01	0.91	7.72E-01	6.39E-01	1.54E+05	1.40E+05
7.52E+04	6.26E+04	5.09E+04	1.37E+05	8.27E+04	5.46E+04	0.68	6.69E-01	1.46E-01	0.90	7.21E-01	6.13E-01	5.66E+04	5.12E+04
2.72E+06	4.16E+06	4.37E+06	5.93E+06	5.30E+06	5.25E+06	0.69	5.15E-01	1.03E-01	0.90	4.52E-01	4.65E-01	3.59E+06	3.25E+06
5.14E+05	8.33E+05	7.86E+05	1.01E+06	1.05E+06	7.18E+05	0.70	5.90E-01	1.54E-01	0.90	5.91E-01	5.64E-01	6.51E+05	5.88E+05
1.65E+05	1.30E+05	1.04E+05	1.86E+05	1.47E+05	1.64E+05	0.68	5.18E-01	1.15E-01	0.90	5.86E-01	5.64E-01	1.19E+05	1.07E+05
1.31E+05	3.10E+05	2.65E+05	4.04E+05	2.12E+05	5.67E+05	0.69	6.64E-01	1.62E-01	0.90	6.67E-01	5.82E-01	2.62E+05	2.36E+05
1.89E+05	1.89E+05	1.66E+05	2.77E+05	3.15E+05	2.65E+05	0.71	5.96E-01	1.45E-01	0.90	6.33E-01	5.83E-01	1.84E+05	1.66E+05
2.34E+06	3.73E+06	3.61E+06	5.83E+06	5.31E+06	4.73E+06	0.69	6.19E-01	1.72E-01	0.90	5.88E-01	5.76E-01	3.27E+06	2.95E+06

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568938765	Carbohydrate sulfotransferase 12	2	LYANHTSLPASVSEAFSAGLK	Deamidated(4)	5.39	3	722.0
568987063	stabilin-1	7	VLTMANQVLTVNISEEGR	Deamidated(12)Oxidation(4)	5.09	2	996.0
755537649	Platelet endothelial cell adhesion molecule	8	GHAIGISCQSENGTAPITYHLMK	Carbamidomethyl(8)Deamidated(12)Oxidation(22)	6.27	3	834.7
146231960	Chondroitin sulfate proteoglycan 4	2	LDPTVLDASELANR	Deamidated(13)	3.87	2	757.9
19111162	Transmembrane 9 superfamily member 3	1	IVDVNLTSEGK	Deamidated(5)	2.61	2	587.8
153791270	Laminin subunit gamma-1	12	YEQAKNISQDLEK	Deamidated(6)	4.7	2	783.9
153791389	Integrin alpha-1	13	SQNDKFNVS LTVK	Deamidated(3)Deamidated(7)	2.9	2	740.9
568922098	Prostaglandin F2 receptor negative regulator	3	DLDLSCNITTD	Carbamidomethyl(6)Deamidated(7)	2.94	2	712.3
6754900	5'-nucleotidase	3	LDNYSTQELGR	Deamidated(3)	3.18	2	648.8
568995055	Transferrin receptor protein 1	2	QKNITAFNETLFR	Deamidated(3)Deamidated(8)	3.78	3	528.6
6754374	Immunoglobulin superfamily containing leucine-rich repeat protein	1	DLEGVPPGFANVTTL SLSANR	Deamidated(12)	4.47	3	752.7
46309573	Protein sel-1 homolog 1	3	MYSEGS DIVPQSN ETALHYFK	Deamidated(13)Oxidation(1)	5.35	3	811.7
568922098	Prostaglandin F2 receptor negative regulator	3	EAATSLSNPIEIDFQTSGPTFNASVHSDTPSVTR	Deamidated(22)	7.61	3	1193.2
165972321	LEM domain-containing protein 2	1	CIPVLEAQEYIANVTSSPSSR	Carbamidomethyl(1)Deamidated(13)	4.23	3	774.7
755532856	Laminin, alpha 2	17	NSGLLGALNDTMDKLSAITNDTAAK	Deamidated(1)Deamidated(9)Deamidated(20)Oxidation(12)	7.52	3	851.4
569003077	Cadherin-2	6	ILSQAPSTPSPNMF TINNETGDIITVAAGLDR	Deamidated(12)Deamidated(18)Oxidation(13)	4.92	3	1120.9
49457857	Myelin protein zero-like protein 1	2	DASINIENIQAVHNGTYICDVK	Carbamidomethyl(19)Deamidated(14)	4.86	3	825.7
568950756	ADAMTS-like protein 3	3	ANGTVQVVSPR	Deamidated(2)	3.39	2	564.8
6755863	Endoplasmic reticulum protein	3	TDDEVVQREEEAIQLDGLNASQIR	Deamidated(19)	6.87	3	910.4
568915555	Integrin alpha V	4	ANTTQPGIVEGGQVLK	Deamidated(2)	3.48	2	806.9
268370173	Peroxidase homolog	4	VYCNLSAAYTFEDLKNEIK	Carbamidomethyl(3)Deamidated(4)	5.14	3	760.4
568920137	Laminin subunit alpha-5	15	LLGLGLPVSGTFHNFSGCISNVFVQR	Carbamidomethyl(18)Deamidated(14)	6.08	3	940.8
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	TLSRPPENCNETSK	Carbamidomethyl(9)Deamidated(10)	3.12	3	545.3
568905353	Extracellular sulfatase	3	DYFTDLITNESINYFK	Deamidated(9)	4.74	2	992.5
6680878	Lysosome membrane protein 2	7	TMVFPVMYLNESVLIDKETANQLK	Deamidated(10)Deamidated(21)Oxidation(2)Oxidation(7)	7.25	3	939.5
156616286	Collagen alpha-6(VI) chain	11	LGNFSELATHNQTF LKK	Deamidated(3)Deamidated(11)	5.21	3	650.7

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2164.1	48.0	17	1.15E+05	1.81E+05	1.68E+05	8.16E+04	1.68E+05	1.60E+05	3.66E+04	1.28E+05	6.51E+04	3.45E+04	7.38E+04
1991.0	44.2	19	2.51E+05	2.59E+05	3.72E+05	1.62E+05	4.03E+05	4.24E+05	8.43E+04	2.47E+05	1.46E+05	1.25E+05	2.72E+05
2502.2	32.5	21	2.00E+05	2.20E+05	3.47E+05	1.88E+05	4.80E+05	4.95E+05	1.78E+05	2.00E+05	1.24E+05	1.48E+05	2.23E+05
1514.8	45.9	18	7.13E+05	9.06E+05	1.19E+06	4.15E+05	1.32E+06	1.22E+06	5.88E+05	6.63E+05	4.50E+05	2.87E+05	6.74E+05
1174.6	32.4	34	6.91E+06	6.88E+06	8.91E+06	3.68E+06	8.60E+06	7.99E+06	3.10E+06	5.50E+06	2.76E+06	2.29E+06	4.81E+06
1566.8	26.7	19	6.31E+05	2.49E+05	5.09E+05	2.71E+05	1.07E+06	8.63E+05	2.69E+05	2.68E+05	2.08E+05	2.98E+05	2.05E+05
1480.8	32.5	10	8.31E+04	1.14E+05	2.61E+05	3.25E+04	1.52E+05	1.49E+05	3.08E+04	8.59E+04	3.37E+04	1.91E+04	1.17E+05
1423.6	40.6	12	1.41E+05	2.05E+05	2.52E+05	1.01E+05	3.12E+05	2.72E+05	1.44E+05	1.90E+05	1.11E+05	6.30E+04	1.86E+05
1296.6	28.2	14	1.27E+05	6.74E+04	1.42E+05	7.31E+04	1.68E+05	1.57E+05	9.18E+04	1.14E+05	5.60E+04	3.35E+04	5.68E+04
1583.8	42.2	8	1.14E+05	4.82E+04	2.13E+05	2.73E+04	3.33E+05	3.05E+05	8.69E+04	1.73E+05	9.97E+04	6.83E+04	1.07E+05
2256.2	60.6	48	2.87E+05	3.82E+05	5.33E+05	2.59E+05	6.28E+05	5.50E+05	7.68E+04	3.99E+05	2.06E+05	1.34E+05	3.43E+05
2433.1	41.9	18	6.94E+05	7.79E+05	9.76E+05	3.73E+05	1.18E+06	1.09E+06	4.40E+05	7.57E+05	3.67E+05	2.71E+05	5.61E+05
3577.7	51.4	17	2.49E+05	3.44E+05	4.97E+05	1.91E+05	4.58E+05	4.18E+05	7.69E+04	3.09E+05	1.38E+05	4.83E+04	3.78E+05
2322.1	58.2	15	8.77E+04	5.65E+04	1.47E+05	4.16E+04	2.04E+05	1.74E+05	2.34E+04	9.44E+04	4.35E+04	5.35E+04	7.85E+04
2552.2	52.2	61	2.05E+05	1.72E+05	4.60E+05	1.38E+05	6.78E+05	5.19E+05	4.14E+04	2.53E+05	1.06E+05	1.34E+05	1.83E+05
3360.7	61.0	50	4.20E+05	2.52E+05	9.79E+05	3.89E+05	1.07E+06	9.73E+05	7.86E+04	9.78E+05	6.10E+05	2.27E+05	9.24E+05
2475.2	44.5	4	5.53E+04	9.40E+04	1.24E+05	4.27E+04	9.15E+04	9.38E+04	2.92E+04	5.97E+04	4.51E+04	2.70E+04	6.25E+04
1128.6	25.9	16	1.73E+05	1.78E+05	1.39E+05	4.95E+04	2.28E+05	1.77E+05	9.11E+04	9.74E+04	3.48E+04	4.28E+04	8.11E+04
2729.3	47.8	16	8.76E+05	1.05E+06	1.33E+06	6.11E+05	1.09E+06	1.01E+06	3.29E+05	6.37E+05	3.62E+05	1.87E+05	6.34E+05
1612.9	34.7	38	1.69E+06	2.51E+06	2.63E+06	1.07E+06	2.35E+06	2.30E+06	1.66E+06	1.31E+06	9.16E+05	5.90E+05	1.15E+06
2279.1	49.8	17	3.27E+05	4.30E+05	9.11E+05	3.38E+05	5.64E+05	6.07E+05	8.16E+04	3.19E+05	1.32E+05	2.30E+05	4.99E+05
2820.5	61.3	26	2.47E+05	2.88E+05	7.59E+05	1.06E+05	7.28E+05	6.08E+05	4.36E+04	3.92E+05	1.33E+05	1.07E+05	3.17E+05
1633.7	18.8	13	6.90E+05	4.09E+05	6.93E+05	8.89E+02	8.12E+05	1.05E+05	5.91E+05	2.96E+05	1.78E+05	4.34E+04	2.33E+05
1983.9	70.9	32	8.81E+04	1.93E+05	2.10E+05	5.40E+04	2.05E+05	1.95E+05	2.02E+04	1.20E+05	5.79E+04	4.84E+04	1.04E+05
2816.4	54.0	54	2.00E+06	4.29E+05	2.19E+06	4.82E+05	8.72E+05	6.91E+05	5.84E+05	4.23E+05	2.41E+05	4.14E+05	9.03E+05
1950.0	38.3	1	5.09E+04	4.74E+04	3.03E+04	4.25E+04	1.18E+05	1.17E+05	1.47E+04	3.71E+04	2.01E+04	3.70E+04	3.48E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
8.05E+04	6.58E+04	8.52E+04	1.35E+05	1.04E+05	1.22E+05	0.72	5.65E-01	1.14E-01	0.90	6.08E-01	5.50E-01	7.10E+04	6.41E+04
1.18E+05	1.36E+05	1.31E+05	2.18E+05	1.77E+05	2.90E+05	0.70	5.85E-01	1.20E-01	0.90	5.73E-01	5.20E-01	1.49E+05	1.34E+05
1.18E+05	1.85E+05	1.40E+05	2.59E+05	2.52E+05	1.29E+05	0.67	5.50E-01	1.03E-01	0.90	5.25E-01	4.81E-01	1.50E+05	1.35E+05
3.67E+05	4.98E+05	5.42E+05	8.98E+05	7.88E+05	5.91E+05	0.70	5.37E-01	8.86E-02	0.90	4.90E-01	4.40E-01	4.72E+05	4.24E+05
3.21E+06	3.51E+06	3.90E+06	5.91E+06	5.35E+06	4.63E+06	0.70	4.72E-01	6.37E-02	0.90	4.36E-01	4.08E-01	3.44E+06	3.09E+06
2.78E+05	2.35E+05	2.76E+05	6.16E+05	3.80E+05	2.36E+05	0.65	6.99E-01	1.72E-01	0.90	7.58E-01	6.16E-01	2.63E+05	2.36E+05
4.08E+04	6.61E+04	7.13E+04	8.59E+04	8.58E+04	9.13E+04	0.69	7.90E-01	2.61E-01	0.90	8.89E-01	6.78E-01	5.83E+04	5.24E+04
6.73E+04	1.35E+05	1.16E+05	1.45E+05	1.71E+05	2.06E+05	0.71	5.48E-01	9.32E-02	0.90	5.24E-01	4.61E-01	1.10E+05	9.89E+04
7.33E+04	5.29E+04	6.62E+04	1.23E+05	8.80E+04	1.26E+05	0.70	5.56E-01	8.28E-02	0.90	5.39E-01	4.64E-01	6.30E+04	5.64E+04
8.92E+04	7.98E+04	1.27E+05	1.37E+05	1.74E+05	6.57E+04	0.68	7.21E-01	2.29E-01	0.89	7.75E-01	6.31E-01	8.82E+04	7.89E+04
1.54E+05	2.48E+05	2.25E+05	3.77E+05	3.33E+05	2.52E+05	0.70	5.79E-01	1.27E-01	0.89	5.83E-01	5.11E-01	2.11E+05	1.89E+05
3.62E+05	4.88E+05	4.68E+05	6.45E+05	7.45E+05	5.86E+05	0.70	4.93E-01	7.46E-02	0.89	4.44E-01	4.00E-01	4.23E+05	3.78E+05
1.00E+05	1.44E+05	1.60E+05	2.87E+05	3.02E+05	2.86E+05	0.72	7.38E-01	2.02E-01	0.89	7.88E-01	6.07E-01	1.70E+05	1.52E+05
4.19E+04	6.17E+04	6.68E+04	7.90E+04	8.83E+04	4.52E+04	0.66	6.14E-01	1.77E-01	0.89	6.53E-01	5.82E-01	5.39E+04	4.81E+04
1.89E+05	1.57E+05	1.43E+05	3.53E+05	2.48E+05	8.85E+04	0.65	7.80E-01	2.30E-01	0.89	8.66E-01	6.53E-01	1.56E+05	1.39E+05
4.51E+05	2.22E+05	4.25E+05	5.20E+05	5.66E+05	3.46E+05	0.72	7.72E-01	2.46E-01	0.89	9.46E-01	6.70E-01	3.82E+05	3.41E+05
3.56E+04	5.12E+04	4.55E+04	5.73E+04	5.81E+04	5.75E+04	0.70	4.87E-01	8.86E-02	0.89	4.92E-01	4.56E-01	4.09E+04	3.65E+04
8.82E+04	8.64E+04	6.79E+04	1.12E+05	1.16E+05	1.01E+05	0.67	5.23E-01	9.63E-02	0.89	5.49E-01	4.85E-01	7.23E+04	6.43E+04
2.84E+05	5.20E+05	5.51E+05	8.41E+05	7.91E+05	7.24E+05	0.70	5.85E-01	1.06E-01	0.89	5.90E-01	4.76E-01	4.60E+05	4.09E+05
8.54E+05	1.25E+06	9.72E+05	1.90E+06	1.79E+06	1.67E+06	0.70	5.06E-01	6.09E-02	0.89	4.71E-01	3.69E-01	1.04E+06	9.24E+05
2.37E+05	3.25E+05	1.76E+05	2.12E+05	2.45E+05	2.13E+05	0.65	6.50E-01	1.45E-01	0.89	8.05E-01	6.01E-01	2.29E+05	2.03E+05
1.25E+05	2.12E+05	1.90E+05	3.91E+05	3.55E+05	3.11E+05	0.68	7.98E-01	2.63E-01	0.89	8.35E-01	6.31E-01	2.04E+05	1.81E+05
1.68E+05	2.99E+05	2.77E+05	3.92E+05	3.15E+05	6.13E+05	0.70	8.82E-01	2.84E-01	0.88	9.41E-01	6.42E-01	2.37E+05	2.09E+05
7.21E+04	7.08E+04	6.97E+04	1.26E+05	1.03E+05	1.01E+05	0.68	6.05E-01	1.62E-01	0.88	6.22E-01	5.37E-01	7.25E+04	6.40E+04
2.24E+05	6.75E+05	6.35E+05	3.14E+05	8.70E+05	5.76E+05	0.66	8.13E-01	2.60E-01	0.88	1.01E+00	6.79E-01	4.85E+05	4.27E+05
3.34E+04	1.92E+04	2.57E+04	5.13E+04	4.96E+04	2.12E+04	0.64	6.88E-01	1.88E-01	0.88	7.82E-01	5.89E-01	2.90E+04	2.56E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568920137	Laminin subunit alpha-5	15	RLNTTGISFGCTADLLVGR	Carbamidomethyl(11)Deamidated(3)	4.58	3	684.7
568992751	Transmembrane protein 106C	1	SEHLVNFTVK	Deamidated(6)	2.67	2	587.8
160333372	Lumican	5	LSHNELADSGVPGNSFNISLLELDL SYNK	Deamidated(14)	4.42	3	1078.9
133778978	Cation-independent mannose-6-phosphate receptor	12	DAGVGFPEYQEEDNSTYNFR	Deamidated(14)	5.28	2	1170.0
133778978	Cation-independent mannose-6-phosphate receptor	12	ISTNITLVCKPGDLESAPVLR	Carbamidomethyl(9)Deamidated(4)	4.36	3	762.1
161086902	Voltage-dependent calcium channel subunit alpha-2/delta-	6	SFSGLLDCGNCSR	Carbamidomethyl(8)Carbamidomethyl(11)Deamidated(10)	3.17	2	737.3
153791270	Laminin subunit gamma-1	12	MAAANVSITQPESTGEPNNMTLLAE EARK	Deamidated(5)Deamidated(19)Oxidation(1)Oxidation(20)	3.24	3	1036.5
568933000	Platelet glycoprotein 4	5	VFNGKDNISK	Deamidated(3)Deamidated(7):Carbamyl	2.7	2	583.8
568911077	Nicastrin	4	LLNATHQIGCQSSISGDTGVIHVVEK EEDLK	Carbamidomethyl(10)Deamidated(3)	5.59	5	676.5
339895744	Collagen alpha-3(VI) chain	5	QINPPHTANSSLTSK	Deamidated(9)	3.96	3	532.6
755532856	Laminin, alpha 2	17	GLFPAVLNLASNALITTNATCGEK	Carbamidomethyl(21)Deamidated(12))Deamidated(18)	5.09	3	826.4
225637540	transforming growth factor beta-3 preproprotein	1	LTSPPEPSVMTHVPYQVLALYNSTR	Deamidated(22)Oxidation(10)	5.68	3	939.8
568930481	Alkaline phosphatase, tissue-nonspecific isozyme	1	VVDGERENVSMVDYAHNNYQAQS AVPLR	Deamidated(8)Oxidation(11)	4.36	4	795.4
755495449	Immunoglobulin superfamily member 8	2	IGPGELELLCNVSGALPPPGR	Carbamidomethyl(11)Deamidated(12))	5.32	3	748.7
144094256	Sulfatase-modifying factor 1	1	FVNSTGYLTEAEK	Deamidated(3)	3.83	2	730.4
568939489	Epsilon-Sarcoglycan	1	LNAINITSALDR	Deamidated(5)	3.2	2	651.4
23943820	Paired immunoglobulin-like type 2 receptor alpha	1	DFHGEFIYNSSLPFIHEHFK	Deamidated(9)	3.74	4	617.0
755530199	Integrin alpha-11	3	VCNVSYPFFR	Carbamidomethyl(2)Deamidated(3)	2.66	2	645.3
755549025	Glycosyltransferase 8 domain-containing protein 1	2	RQNVTNQLEK	Deamidated(3)	2.59	2	615.8
133778978	Cation-independent mannose-6-phosphate receptor	12	AGINASYSEK	Deamidated(4)	2.56	2	520.7
568991301	Plexin B2	10	VVFLSPAVPEEPEAYNLTVLIR	Deamidated(16)	4.41	2	1229.2
569000314	Elastin microfibril interfacier 2	3	LQEDVNALHSQLNHSECTGYLQN GVSDSR	Carbamidomethyl(17)Deamidated(13))Deamidated(24)	6.14	4	844.4
157057166	Toll-like receptor 9	5	ALTNGTLPNGTLLQK	Deamidated(4)Deamidated(9)	3.84	2	771.9
225903442	Integrin alpha-5	6	TEKDPQNDPVGTCYLSTENFTR	Carbamidomethyl(13)Deamidated(19))	5.95	3	858.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2052.1	50.0	14	2.13E+05	2.30E+05	5.70E+05	1.45E+05	7.15E+05	6.50E+05	8.68E+04	3.54E+05	1.41E+05	9.29E+04	3.80E+05
1174.6	33.2	5	9.79E+04	1.71E+05	2.47E+05	4.82E+04	1.85E+05	2.09E+05	1.49E+05	1.09E+05	6.40E+04	5.57E+04	1.02E+05
3234.6	63.1	63	3.53E+05	5.42E+05	1.29E+06	5.03E+05	1.11E+06	8.97E+05	1.71E+05	5.12E+05	1.33E+05	8.87E+04	1.11E+05
2339.0	47.6	37	4.45E+05	6.20E+05	6.64E+05	2.31E+05	6.04E+05	5.55E+05	2.32E+05	3.16E+05	2.35E+05	2.00E+05	3.46E+05
2284.2	46.1	17	5.35E+05	1.16E+06	1.52E+06	3.27E+05	1.29E+06	1.25E+06	2.49E+05	7.84E+05	2.95E+05	2.25E+05	7.90E+05
1473.6	39.0	13	1.20E+05	7.91E+04	2.34E+05	3.25E+04	2.69E+05	3.31E+05	9.90E+04	1.28E+05	5.74E+04	3.49E+04	2.00E+05
3107.5	36.7	6	8.93E+04	5.41E+04	5.22E+04	6.67E+04	1.96E+05	1.64E+05	2.95E+04	6.16E+04	3.69E+04	5.13E+04	4.98E+04
1166.6	33.8	1	1.79E+05	4.20E+04	5.19E+04	3.28E+04	2.59E+05	2.48E+05	5.28E+04	7.33E+04	5.47E+04	7.87E+04	4.55E+04
3378.7	40.5	16	2.61E+05	3.65E+05	5.64E+05	8.03E+04	5.30E+05	5.74E+05	1.31E+05	2.94E+05	1.16E+05	9.27E+04	3.11E+05
1595.8	23.9	44	8.23E+05	3.50E+05	8.67E+05	1.10E+04	1.83E+06	1.73E+06	4.93E+05	6.21E+05	3.25E+05	4.68E+05	6.23E+05
2477.3	65.8	135	6.58E+04	1.59E+05	5.84E+05	4.75E+04	3.31E+05	3.19E+05	4.51E+04	1.75E+05	6.67E+04	4.50E+04	2.26E+05
2817.4	49.8	17	2.82E+05	4.67E+05	6.60E+05	1.96E+05	6.49E+05	6.39E+05	1.13E+05	4.28E+05	1.43E+05	1.62E+05	2.41E+05
3178.5	32.8	5	1.63E+05	8.33E+04	2.52E+05	4.37E+04	2.41E+05	2.18E+05	8.78E+04	1.50E+05	7.76E+04	6.59E+04	1.08E+05
2244.2	63.2	30	1.04E+05	2.32E+05	2.44E+05	7.92E+04	2.67E+05	2.13E+05	3.89E+04	1.51E+05	7.04E+04	3.19E+04	1.42E+05
1459.7	36.4	16	2.03E+05	2.83E+05	3.19E+05	1.87E+05	3.98E+05	3.71E+05	1.81E+05	1.81E+05	1.33E+05	1.04E+05	1.40E+05
1301.7	48.6	15	5.95E+05	7.13E+05	8.22E+05	4.11E+05	1.20E+06	1.04E+06	3.96E+05	7.34E+05	3.36E+05	2.14E+05	7.27E+05
2465.2	48.7	6	7.99E+04	1.59E+05	1.42E+05	7.35E+04	1.18E+05	1.22E+05	1.02E+04	1.24E+05	7.45E+04	2.04E+04	8.38E+04
1289.6	45.6	9	5.36E+04	1.32E+05	1.25E+05	3.01E+04	1.63E+05	1.04E+05	9.20E+04	7.45E+04	4.25E+04	2.37E+04	7.34E+04
1230.6	18.2	7	9.90E+04	2.28E+04	5.14E+04	0.00E+00	1.09E+05	1.37E+05	1.08E+05	7.83E+03	6.49E+02	7.13E+03	6.36E+03
1040.5	22.9	6	7.98E+05	7.86E+05	9.40E+05	8.70E+02	1.28E+06	1.15E+06	6.12E+05	7.12E+05	2.77E+05	2.99E+05	5.25E+05
2457.3	66.6	27	6.02E+05	7.48E+05	4.59E+05	7.15E+05	1.78E+06	1.45E+06	2.43E+05	1.03E+06	6.08E+05	4.52E+05	6.28E+05
3374.5	36.7	5	1.73E+05	1.83E+05	3.36E+05	1.23E+05	4.81E+05	4.77E+05	1.41E+05	1.82E+05	5.64E+04	8.97E+04	1.70E+05
1542.8	43.6	3	7.54E+04	7.32E+04	1.54E+05	2.83E+04	1.18E+05	1.05E+05	5.43E+04	9.70E+04	2.67E+04	2.03E+04	8.27E+04
2573.1	38.9	17	5.14E+05	7.38E+05	9.27E+05	2.53E+05	8.94E+05	8.93E+05	5.36E+05	3.64E+05	3.50E+05	1.89E+05	5.36E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.61E+05	2.23E+05	1.72E+05	3.04E+05	2.32E+05	2.80E+05	0.67	7.27E-01	2.12E-01	0.88	7.85E-01	5.90E-01	1.92E+05	1.69E+05
7.97E+04	9.37E+04	8.36E+04	1.37E+05	1.06E+05	1.09E+05	0.67	4.88E-01	8.13E-02	0.88	4.72E-01	4.03E-01	8.06E+04	7.10E+04
1.53E+05	2.10E+05	3.84E+05	6.83E+05	9.04E+05	8.65E+05	0.69	1.02E+00	3.16E-01	0.88	1.11E+00	6.83E-01	3.34E+05	2.94E+05
2.61E+05	2.59E+05	2.04E+05	3.64E+05	4.40E+05	2.90E+05	0.68	4.78E-01	6.43E-02	0.88	4.62E-01	3.71E-01	2.48E+05	2.18E+05
3.69E+05	5.41E+05	3.96E+05	6.42E+05	7.80E+05	7.56E+05	0.68	6.69E-01	1.76E-01	0.88	7.05E-01	5.45E-01	4.64E+05	4.08E+05
6.26E+04	8.63E+04	1.05E+05	7.24E+04	1.20E+05	1.09E+05	0.66	7.83E-01	2.10E-01	0.88	8.88E-01	6.07E-01	8.27E+04	7.26E+04
5.96E+04	3.84E+04	3.65E+04	9.41E+04	5.48E+04	4.03E+04	0.64	6.64E-01	1.69E-01	0.88	7.47E-01	5.53E-01	4.57E+04	4.01E+04
8.69E+04	3.96E+04	6.16E+04	1.13E+05	1.12E+05	2.14E+04	0.63	8.32E-01	2.45E-01	0.88	1.01E+00	6.55E-01	6.07E+04	5.32E+04
1.53E+05	1.96E+05	1.77E+05	2.31E+05	2.66E+05	3.17E+05	0.67	6.50E-01	1.65E-01	0.88	6.70E-01	5.20E-01	1.81E+05	1.59E+05
3.51E+05	3.66E+05	4.46E+05	5.68E+05	6.51E+05	5.68E+05	0.64	6.58E-01	2.22E-01	0.88	6.83E-01	5.81E-01	4.29E+05	3.76E+05
7.73E+04	1.27E+05	8.93E+04	1.67E+05	1.70E+05	1.62E+05	0.67	9.07E-01	3.26E-01	0.87	1.03E+00	6.77E-01	1.10E+05	9.62E+04
2.41E+05	3.07E+05	1.66E+05	3.51E+05	3.57E+05	2.94E+05	0.67	5.63E-01	1.23E-01	0.87	6.02E-01	4.81E-01	2.24E+05	1.96E+05
1.13E+05	1.06E+05	9.43E+04	1.30E+05	9.36E+04	5.24E+04	0.65	5.18E-01	9.21E-02	0.87	6.31E-01	4.69E-01	8.31E+04	7.26E+04
7.38E+04	9.46E+04	7.62E+04	1.33E+05	1.56E+05	1.51E+05	0.69	6.69E-01	1.65E-01	0.87	6.92E-01	5.07E-01	8.87E+04	7.74E+04
1.62E+05	1.86E+05	1.24E+05	2.45E+05	1.70E+05	1.97E+05	0.66	4.27E-01	3.37E-02	0.87	4.01E-01	2.45E-01	1.42E+05	1.24E+05
2.39E+05	4.98E+05	4.11E+05	5.76E+05	5.32E+05	5.79E+05	0.68	5.44E-01	7.89E-02	0.87	5.51E-01	3.90E-01	3.95E+05	3.45E+05
7.13E+04	6.02E+04	5.66E+04	8.26E+04	9.88E+04	1.01E+05	0.72	5.85E-01	1.31E-01	0.87	6.74E-01	5.01E-01	6.00E+04	5.23E+04
3.59E+04	1.13E+05	3.01E+04	6.30E+04	7.10E+04	7.93E+04	0.67	6.61E-01	1.27E-01	0.87	7.75E-01	5.35E-01	5.15E+04	4.50E+04
3.53E+04	3.31E+04	3.56E+04	6.14E+04	5.65E+04	6.31E+04	0.63	9.46E-01	2.83E-01	0.87	1.22E+00	7.06E-01	3.08E+04	2.69E+04
4.39E+05	5.60E+05	5.04E+05	3.09E+05	6.51E+05	5.36E+05	0.66	5.29E-01	1.05E-01	0.87	5.85E-01	4.49E-01	4.12E+05	3.59E+05
4.38E+05	4.58E+05	4.09E+05	8.82E+05	7.77E+05	5.92E+05	0.68	6.01E-01	1.54E-01	0.87	5.94E-01	4.76E-01	4.91E+05	4.27E+05
1.91E+05	1.17E+05	8.94E+04	1.40E+05	2.52E+05	1.67E+05	0.64	6.42E-01	1.45E-01	0.87	7.13E-01	5.18E-01	1.29E+05	1.13E+05
2.89E+04	5.35E+04	4.92E+04	9.65E+04	4.20E+04	6.74E+04	0.68	6.68E-01	1.39E-01	0.87	7.51E-01	5.22E-01	4.61E+04	4.01E+04
2.93E+05	4.12E+05	4.23E+05	4.67E+05	4.45E+05	4.90E+05	0.67	4.74E-01	5.98E-02	0.87	4.68E-01	3.27E-01	3.45E+05	3.00E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
157057166	Toll-like receptor 9	5	FSAAASCSNITR	Carbamidomethyl(7)Deamidated(9)	3.42	2	643.3
226437659	Endoglin	3	QNGTETQEVFLVLSNK	Deamidated(2)	3.29	3	636.3
31982236	Integrin alpha 6	3	ANHSGAVVLLK	Deamidated(2)	3.87	2	555.3
226437629	Embigin	4	YIINGSHANETR	Deamidated(4)Deamidated(9)	3.37	3	459.6
568926043	Type XV collagen	1	EVDTDPENLTTTASGDGEVPTSTD GDTEADSSPTGGPTLKPR	Deamidated(9)	5.42	3	1439.3
568990242	Oncostatin M receptor	3	NLGPNTTSTTITSDDFKPGVR	Deamidated(5)	4.36	3	741.4
226437659	Endoglin	3	KLNASIVTSFVELPLVSNVSLR	Deamidated(3)Deamidated(18)	5.99	3	796.8
85861260	ER membrane protein complex subunit 1	1	FINYNQTVSR	Deamidated(5)	2.68	2	621.8
568987063	stabilin-1	7	NSSITLPADSR	Deamidated(1)	3.07	2	581.3
568954529	Protocadherin Fat 1	6	INSSVTDVEEIIIGVR	Deamidated(2)	4.22	2	816.4
568911950	Hydroxysteroid 11-beta dehydrogenase 1	1	QSNGLSIAVISSLAGK	Deamidated(3)	3.26	2	716.9
226246610	Alpha-mannosidase 2	3	DSVINLSESVEDGPR	Deamidated(5)	4.3	2	809.4
754170702	Ectonucleoside triphosphate diphosphohydrolase 1	2	QETFGALDLGGASTQITFVPQNSTI ESPENSLQFR	Deamidated(22)	6.14	4	946.7
124486680	Integrin alpha L	1	GLFPDGSHELSTGNTSITPDK	Deamidated(13)	4.4	3	691.7
568959112	SID1 transmembrane family, member 2	2	TYADDVNSELVNIYTFNHTVTR	Deamidated(17)	5.92	3	858.4
111607447	Integrin beta	2	LNFTGPGEPDSLRL	Deamidated(2)	2.66	2	701.9
298676452	ATP-dependent (S)-NAD(P)H- hydrate dehydratase	1	LSQALGNITVVQK	Deamidated(7)	2.8	2	686.4
124249351	Inter-alpha-trypsin inhibitor heavy chain H1	1	ANLSSQVLK	Deamidated(2)	2.51	2	480.8
568960899	Neuroplastin	4	KKENGVFEEISNSSGR	Deamidated(4)Deamidated(12)	4.47	2	891.9
568915418	Prolyl endopeptidase FAP	4	DILNGTFSYK	Deamidated(4)	2.78	2	579.8
568915418	Prolyl endopeptidase FAP	4	ESYIILSNSTMK	Deamidated(8)Oxidation(11)	3.17	2	701.8
124494256	Pro-low-density lipoprotein receptor-related protein 1	22	IETILLNGTDR	Deamidated(7)	3.17	2	623.3
229608946	Torsin-1A-interacting protein 1	1	HLNSSLPRPQPAILLLTAAQDAAEVL K	Deamidated(3)	7.71	4	717.7
114326497	Laminin subunit beta-1	6	MEMPSTPQQLQNLTEDIRER	Deamidated(12)Oxidation(1)Oxidatio n(3)	4.58	3	817.1
85719301	carcinoembryonic antigen- related cell adhesion molecule 1	4	MTLSQNNNSILR	Deamidated(6)Oxidation(1)	3.61	2	647.3
568950756	ADAMTS-like protein 3	3	RINLTVGSR	Deamidated(3)	3.21	2	508.8
37674242	Bone marrow stromal antigen	2	NTTHLLQR	Deamidated(1)	2.76	2	492.3
19527206	CD276 antigen	3	DGQGVPLTGNVTTSQMANER	Deamidated(10)Oxidation(16)	4.55	3	698.0
6754588	Lymphocyte antigen 86	2	ATVACANATVTSS	Carbamidomethyl(5)Deamidated(7)	2.55	2	627.3

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1285.6	26.7	10	2.80E+05	2.35E+05	3.29E+05	5.60E+04	3.03E+05	2.79E+05	1.18E+05	1.76E+05	7.50E+04	8.87E+04	2.31E+05
1907.0	56.4	22	1.45E+05	1.64E+05	2.26E+05	6.81E+04	1.95E+05	1.99E+05	4.68E+04	1.11E+05	6.39E+04	5.01E+04	1.22E+05
1109.6	28.8	14	3.67E+05	3.81E+05	4.94E+05	0.00E+00	5.51E+05	4.56E+05	2.52E+05	2.32E+05	1.21E+05	1.31E+05	2.52E+05
1376.6	22.7	8	1.08E+05	1.08E+05	1.23E+05	1.26E+03	1.78E+05	1.26E+05	1.04E+05	9.52E+04	7.45E+04	2.69E+04	5.80E+04
4315.9	40.6	3	8.97E+04	1.20E+05	1.12E+05	2.74E+04	1.32E+05	1.17E+05	5.83E+04	9.28E+04	2.45E+04	4.61E+04	4.61E+04
2222.1	36.3	12	3.74E+05	3.85E+05	4.79E+05	1.76E+05	6.25E+05	5.25E+05	2.92E+05	3.74E+05	1.66E+05	1.51E+05	2.65E+05
2388.3	66.6	16	1.89E+05	3.48E+05	5.39E+05	1.37E+05	3.22E+05	2.65E+05	9.22E+04	3.38E+05	4.35E+04	1.52E+04	1.19E+05
1242.6	31.0	19	1.13E+06	9.46E+05	1.72E+06	5.39E+05	2.61E+06	2.20E+06	9.41E+05	1.16E+06	6.05E+05	6.48E+05	1.06E+06
1161.6	30.6	7	1.15E+05	9.31E+04	1.80E+05	6.72E+04	2.13E+05	1.62E+05	1.13E+05	1.07E+05	5.93E+04	4.43E+04	7.10E+04
1631.8	54.5	16	1.91E+05	2.44E+05	3.18E+05	9.49E+04	4.05E+05	3.01E+05	9.75E+04	2.11E+05	1.04E+05	9.98E+04	1.25E+05
1432.8	44.1	11	1.83E+05	9.39E+04	2.04E+05	9.69E+04	1.60E+05	1.59E+05	8.29E+04	1.11E+05	7.43E+04	3.33E+04	1.75E+05
1617.8	44.9	9	1.01E+05	1.52E+05	1.71E+05	6.97E+04	1.98E+05	1.74E+05	6.01E+04	1.40E+05	6.40E+04	4.68E+04	1.17E+05
3783.8	62.7	37	3.78E+05	3.23E+05	6.74E+05	2.07E+05	5.70E+05	6.65E+05	3.61E+04	3.49E+05	1.97E+05	1.03E+05	3.64E+05
2073.0	39.7	7	1.35E+05	1.07E+05	9.16E+04	8.97E+04	9.72E+04	1.14E+05	4.89E+04	1.11E+05	7.59E+04	2.93E+04	7.69E+04
2573.2	53.6	17	3.10E+05	4.95E+05	5.79E+05	2.35E+05	4.47E+05	4.37E+05	1.01E+05	2.93E+05	1.76E+05	1.14E+05	2.71E+05
1402.7	38.3	22	1.97E+06	2.66E+06	2.67E+06	1.43E+06	2.85E+06	2.63E+06	1.78E+06	1.62E+06	1.54E+06	7.30E+05	1.53E+06
1371.8	37.7	2	2.23E+05	2.73E+05	3.51E+05	1.42E+05	3.53E+05	3.00E+05	1.61E+05	2.09E+05	1.06E+05	1.13E+05	1.87E+05
960.5	30.1	9	1.04E+06	1.24E+06	1.63E+06	1.35E+06	2.04E+06	1.87E+06	1.31E+06	1.10E+06	1.34E+06	6.64E+05	9.75E+05
1782.9	29.2	27	1.17E+06	1.34E+06	1.92E+06	6.35E+05	2.00E+06	1.64E+06	9.67E+05	1.09E+06	5.62E+05	4.64E+05	8.86E+05
1158.6	47.7	4	1.93E+05	2.26E+05	2.99E+05	1.35E+05	2.65E+05	2.42E+05	1.55E+05	1.86E+05	1.33E+05	7.18E+04	1.60E+05
1402.7	37.6	14	4.45E+05	4.37E+05	5.38E+05	3.18E+05	5.34E+05	5.08E+05	2.93E+05	2.65E+05	2.31E+05	1.41E+05	3.69E+05
1245.7	41.5	51	2.79E+06	3.12E+06	4.35E+06	1.77E+06	4.76E+06	4.12E+06	2.69E+06	2.96E+06	1.96E+06	1.26E+06	2.07E+06
2867.6	66.0	105	1.41E+06	1.05E+06	1.76E+06	6.24E+05	2.05E+06	1.91E+06	6.36E+04	1.34E+06	5.06E+05	5.02E+05	6.33E+05
2449.1	42.1	17	4.89E+05	2.08E+05	8.90E+05	2.60E+05	9.88E+05	8.18E+05	1.11E+05	2.51E+05	2.04E+05	3.15E+05	1.63E+05
1293.6	31.3	25	6.68E+05	5.19E+05	9.88E+05	3.81E+05	1.60E+06	1.33E+06	5.55E+05	7.19E+05	5.50E+05	4.10E+05	6.48E+05
1016.6	25.5	2	2.17E+05	2.34E+05	2.31E+05	0.00E+00	3.62E+05	2.55E+05	1.20E+05	1.41E+05	5.48E+04	6.99E+04	1.31E+05
983.5	23.9	9	2.15E+05	2.41E+05	2.67E+05	9.00E+04	3.36E+05	2.98E+05	1.65E+05	1.77E+05	6.12E+04	7.76E+04	1.66E+05
2092.0	33.5	31	2.93E+05	3.73E+05	3.81E+05	2.04E+05	4.05E+05	4.56E+05	2.05E+05	2.85E+05	1.36E+05	9.18E+04	2.55E+05
1253.6	27.0	1	1.76E+05	1.19E+05	1.94E+05	4.95E+04	1.97E+05	1.64E+05	1.25E+05	1.17E+05	4.16E+04	3.40E+04	1.06E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.37E+05	9.70E+04	6.93E+04	1.64E+05	1.57E+05	1.47E+05	0.66	5.82E-01	9.96E-02	0.87	6.48E-01	4.61E-01	1.16E+05	1.01E+05
7.89E+04	6.30E+04	7.59E+04	1.30E+05	1.25E+05	8.20E+04	0.67	5.52E-01	9.49E-02	0.87	5.58E-01	4.08E-01	7.69E+04	6.68E+04
1.89E+05	1.77E+05	1.85E+05	2.65E+05	2.51E+05	2.13E+05	0.66	5.19E-01	1.14E-01	0.87	5.15E-01	4.31E-01	1.78E+05	1.55E+05
6.00E+04	5.45E+04	6.30E+04	1.08E+05	9.85E+04	1.00E+05	0.70	5.99E-01	1.21E-01	0.87	5.86E-01	4.16E-01	5.95E+04	5.17E+04
4.51E+04	6.32E+04	7.06E+04	4.33E+04	6.75E+04	6.72E+04	0.65	4.44E-01	6.09E-02	0.87	5.61E-01	4.23E-01	4.88E+04	4.24E+04
1.82E+05	2.26E+05	2.05E+05	3.51E+05	3.27E+05	3.24E+05	0.67	4.70E-01	5.21E-02	0.87	4.01E-01	2.66E-01	2.14E+05	1.86E+05
8.89E+04	7.76E+04	2.30E+05	3.20E+05	2.94E+05	2.66E+05	0.70	8.81E-01	2.63E-01	0.87	1.04E+00	6.34E-01	1.43E+05	1.24E+05
5.79E+05	7.22E+05	8.90E+05	9.99E+05	1.16E+06	8.04E+05	0.65	5.09E-01	9.61E-02	0.87	4.72E-01	3.62E-01	7.34E+05	6.37E+05
7.05E+04	5.97E+04	6.33E+04	1.38E+05	1.13E+05	9.86E+04	0.67	5.35E-01	6.67E-02	0.87	4.75E-01	3.01E-01	6.94E+04	6.01E+04
1.41E+05	1.55E+05	1.24E+05	1.58E+05	2.09E+05	1.35E+05	0.66	4.77E-01	7.95E-02	0.87	4.85E-01	3.63E-01	1.24E+05	1.07E+05
1.26E+05	8.13E+04	5.93E+04	6.29E+04	6.14E+04	7.72E+04	0.65	5.89E-01	6.49E-02	0.87	7.31E-01	5.07E-01	7.40E+04	6.41E+04
6.67E+04	6.59E+04	7.29E+04	8.90E+04	1.14E+05	1.10E+05	0.68	4.93E-01	6.49E-02	0.87	4.85E-01	3.41E-01	7.23E+04	6.25E+04
1.52E+05	2.18E+05	1.85E+05	3.85E+05	3.34E+05	3.04E+05	0.68	6.74E-01	1.65E-01	0.86	6.86E-01	4.82E-01	2.14E+05	1.85E+05
5.20E+04	7.28E+04	5.24E+04	9.53E+04	6.97E+04	9.64E+04	0.70	4.16E-01	2.54E-02	0.86	4.94E-01	3.22E-01	5.77E+04	4.99E+04
1.56E+05	2.30E+05	1.42E+05	3.46E+05	2.80E+05	3.24E+05	0.68	5.71E-01	9.94E-02	0.86	5.79E-01	4.04E-01	1.96E+05	1.69E+05
1.41E+06	1.30E+06	1.08E+06	2.07E+06	1.68E+06	1.75E+06	0.68	3.78E-01	1.26E-02	0.86	3.73E-01	1.78E-01	1.24E+06	1.06E+06
1.16E+05	1.40E+05	1.42E+05	1.80E+05	1.91E+05	1.68E+05	0.66	3.84E-01	3.00E-02	0.86	3.24E-01	1.95E-01	1.34E+05	1.15E+05
9.66E+05	8.22E+05	9.91E+05	1.26E+06	1.01E+06	1.05E+06	0.67	2.80E-01	3.37E-03	0.86	3.40E-01	1.72E-01	8.43E+05	7.25E+05
6.07E+05	8.17E+05	7.14E+05	1.09E+06	1.13E+06	9.30E+05	0.66	4.55E-01	4.62E-02	0.86	3.92E-01	2.30E-01	7.11E+05	6.11E+05
1.04E+05	1.58E+05	1.19E+05	1.80E+05	1.60E+05	1.46E+05	0.67	3.70E-01	1.31E-02	0.86	3.67E-01	1.73E-01	1.18E+05	1.02E+05
3.28E+05	2.55E+05	1.94E+05	2.62E+05	2.27E+05	2.87E+05	0.65	3.82E-01	1.22E-02	0.86	4.28E-01	2.32E-01	2.26E+05	1.94E+05
1.65E+06	2.14E+06	1.73E+06	3.01E+06	2.47E+06	2.68E+06	0.67	4.03E-01	2.28E-02	0.86	3.46E-01	1.60E-01	1.83E+06	1.57E+06
4.97E+05	5.71E+05	5.33E+05	1.61E+06	1.30E+06	7.53E+05	0.67	7.41E-01	1.75E-01	0.86	7.73E-01	5.02E-01	6.75E+05	5.79E+05
2.78E+05	1.60E+05	1.73E+05	7.31E+05	3.96E+05	1.27E+05	0.62	8.80E-01	2.10E-01	0.86	1.02E+00	6.02E-01	2.55E+05	2.18E+05
5.27E+05	4.24E+05	5.65E+05	6.57E+05	5.54E+05	4.10E+05	0.64	4.53E-01	7.29E-02	0.86	4.90E-01	3.27E-01	4.62E+05	3.96E+05
1.04E+05	1.17E+05	6.76E+04	1.45E+05	1.39E+05	1.55E+05	0.65	5.87E-01	1.36E-01	0.86	5.98E-01	4.43E-01	9.98E+04	8.56E+04
7.84E+04	1.28E+05	1.20E+05	1.82E+05	1.89E+05	1.32E+05	0.65	5.00E-01	5.90E-02	0.86	4.80E-01	3.01E-01	1.15E+05	9.84E+04
1.30E+05	1.84E+05	1.78E+05	2.97E+05	2.14E+05	2.77E+05	0.67	4.72E-01	3.79E-02	0.86	4.54E-01	2.51E-01	1.73E+05	1.49E+05
4.25E+04	9.99E+04	7.50E+04	1.15E+05	1.18E+05	1.04E+05	0.66	5.38E-01	6.80E-02	0.86	5.49E-01	3.40E-01	7.37E+04	6.31E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
59858563	Extracellular matrix protein 2	1	NNITSSGIGPK	Deamidated(1)	3.35	2	544.8
568909067	Torsin-1A-interacting protein	1	HLNASNPSEPATIIIFTAAR	Deamidated(3)	5.27	3	671.0
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	DQELEDNVHISPNGSIITIVGTRPSN HGAYR	Deamidated(13)	5.42	4	848.4
225903442	Integrin alpha-5	6	DKLSPIHIALNFSLDPK	Deamidated(11)	3.64	3	637.0
568948081	Reticulocalbin-3	2	NATYGHYEPGEEFHDVEDAETYKK	Deamidated(1)	7.25	4	708.3
568960103	N-acetylated-alpha-linked acidic dipeptidase 2	3	SIAYINSDSAIEGNYTLR	Deamidated(14)	5.4	2	994.5
31542891	Gamma-glutamyltransferase	2	GDHHQLSHYNLTGVR	Deamidated(10)	2.9	2	867.9
568947434	Aminopeptidase N	9	FTCNQTTDVIIIHSK	Carbamidomethyl(3)Deamidated(4)	4.69	3	593.3
568915917	Tyrosine-protein phosphatase non-receptor type substrate 1	5	DGQELHPLETTVNPSPGKNVSYNISS TVR	Deamidated(18)Deamidated(22)	5.99	4	761.9
165932373	Collectin-12	4	VQSLQTLAANNSALAK	Deamidated(10)	4.09	2	815.4
31542362	ADP-ribosyl cyclase 1	3	EPFYKNSTFGSVEVFLDPNK	Deamidated(6)	4.3	3	802.7
6677993	Solute carrier family 12, member 4	1	TVVVDNETVATR	Deamidated(6)	3.31	2	652.8
569008118	Transmembrane protein 2	1	GDPSIISVNGTDFTFR	Deamidated(9)	3.67	2	863.9
568954529	Protocadherin Fat 1	6	GVNVITVNATDADSK	Deamidated(8)	4.61	2	752.9
568960103	N-acetylated-alpha-linked acidic dipeptidase 2	3	GSLNVSYNIGPGFTGSEYSR	Deamidated(4)	5.24	2	1053.5
568904237	Fibrillin-2	1	SYNGTTCENELPFNVTK	Carbamidomethyl(7)Deamidated(3)Deamidated(14)	3.51	2	988.4
254028203	GPI inositol-deacylase	2	LHVAQPENDSHVALLK	Deamidated(8)	4.11	3	591.3
172072617	Peptidyl-prolyl cis-trans isomerase FKBP9	3	YHYNGTLLDGTLDSSYSR	Deamidated(4)	5.78	3	737.3
153792211	Ectonucleotide pyrophosphatase/phosphodiesterase family member 1	3	QLNLTTEDDDIYHMTVPYGRPR	Deamidated(3)Oxidation(14)	5.83	4	663.6
568922760	Immunoglobulin superfamily member 10	6	IHVYPNGSLVIGSVTEK	Deamidated(6)	4.07	3	605.3
568972029	C-type mannose receptor 2	6	NASLAHVDPYPTQAFLTQAAR	Deamidated(1)	7.45	3	758.1
568955184	Cytokine receptor-like factor 1	2	LLNTSTLALALANLNGSR	Deamidated(3)Deamidated(15)	4.2	3	615.3
124494256	Prolow-density lipoprotein receptor-related protein 1	22	FGHSPLINLTGGLSHASDVVLYHQH K	Deamidated(8)	6.88	4	707.9
568950756	ADAMTS-like protein 3	3	GEHSFNSPGVFTVENTTIEFQK	Deamidated(15)	6.93	3	823.7
224809275	Torsin-3A	1	ISNNLTGLESDLR	Deamidated(4)	4.13	2	716.9
392871558	Receptor-type tyrosine-protein phosphatase C	3	AQNTNYTCVAEILYR	Carbamidomethyl(7)Deamidated(4)	4.64	2	851.9
568922258	Sortilin	2	HLYTTTGGGETDFTNVTSLR	Deamidated(14)	6.91	3	705.3
133778978	Cation-independent mannose-6-phosphate receptor	12	SLLEFNNTMGCPQSDSQHR	Carbamidomethyl(11)Deamidated(6) Oxidation(9)	4.49	3	742.3

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1088.6	25.9	5	4.38E+05	3.29E+05	7.09E+05	4.31E+03	1.13E+06	9.40E+05	5.57E+05	3.50E+05	1.86E+05	2.05E+05	4.53E+05
2011.0	43.9	25	9.54E+05	8.00E+05	1.28E+06	4.22E+05	1.68E+06	1.55E+06	5.50E+05	1.03E+06	5.29E+05	4.37E+05	7.80E+05
3390.7	42.3	7	1.14E+05	1.60E+05	8.05E+04	8.45E+04	2.26E+05	2.51E+05	3.04E+04	1.23E+05	8.05E+04	8.18E+04	1.34E+05
1909.0	51.4	5	3.38E+05	5.25E+05	6.27E+05	2.36E+05	6.94E+05	6.71E+05	2.34E+05	5.20E+05	2.08E+05	1.57E+05	3.78E+05
2830.2	32.9	52	1.94E+06	2.43E+06	2.41E+06	1.05E+06	3.31E+06	3.23E+06	8.24E+05	1.70E+06	7.85E+05	6.91E+05	1.02E+06
1988.0	45.2	46	4.92E+05	5.27E+05	5.81E+05	2.94E+05	7.92E+05	7.58E+05	1.93E+05	4.35E+05	2.44E+05	1.64E+05	5.02E+05
1734.8	24.6	3	2.96E+05	8.82E+04	1.46E+05	4.94E+02	2.34E+05	2.20E+05	1.02E+05	1.37E+05	8.66E+04	7.21E+04	1.07E+05
1777.9	35.0	26	1.48E+06	1.76E+06	2.36E+06	7.61E+05	1.73E+06	1.80E+06	1.13E+06	1.18E+06	6.84E+05	3.78E+05	1.14E+06
3044.5	40.2	9	1.31E+05	1.23E+05	1.42E+05	7.44E+04	1.90E+05	1.44E+05	6.39E+04	9.73E+04	6.23E+04	4.67E+04	6.91E+04
1629.9	38.3	26	2.74E+05	3.54E+05	3.46E+05	1.62E+05	3.97E+05	3.63E+05	2.32E+05	2.45E+05	1.46E+05	9.59E+04	1.56E+05
2406.2	52.0	8	1.56E+05	1.45E+05	2.19E+05	1.11E+05	2.66E+05	1.73E+05	3.95E+04	1.39E+05	9.30E+04	5.84E+04	8.13E+04
1304.7	28.6	18	4.19E+05	4.75E+05	6.31E+05	2.61E+05	8.89E+05	8.00E+05	3.52E+05	5.94E+05	2.33E+05	1.64E+05	3.86E+05
1726.8	53.6	17	1.65E+05	2.46E+05	3.58E+05	1.35E+05	3.49E+05	3.72E+05	7.72E+04	2.54E+05	1.29E+05	8.56E+04	1.96E+05
1504.7	34.7	17	2.53E+05	3.85E+05	3.91E+05	1.86E+05	4.48E+05	4.33E+05	2.43E+05	2.61E+05	1.32E+05	1.09E+05	2.22E+05
2106.0	46.2	31	4.47E+05	6.47E+05	8.70E+05	3.42E+05	7.50E+05	7.18E+05	2.12E+05	4.49E+05	2.57E+05	1.33E+05	5.11E+05
1975.9	43.9	23	1.59E+05	1.30E+05	3.75E+05	1.20E+05	5.50E+05	5.14E+05	2.08E+05	2.49E+05	9.80E+04	1.29E+05	2.23E+05
1771.9	29.8	1	1.95E+05	2.21E+05	3.32E+05	1.37E+05	4.17E+05	3.12E+05	1.65E+05	2.27E+05	9.48E+04	1.13E+05	1.86E+05
2210.0	50.4	36	1.98E+06	3.31E+06	3.10E+06	1.26E+06	3.03E+06	3.02E+06	9.55E+05	1.70E+06	1.26E+06	4.35E+05	1.37E+06
2651.2	38.4	6	1.11E+05	9.65E+04	1.47E+05	8.39E+04	1.33E+05	1.28E+05	2.74E+04	6.17E+04	3.50E+04	4.10E+04	4.93E+04
1814.0	41.5	4	4.90E+04	8.20E+04	9.21E+04	3.62E+04	1.92E+05	1.43E+05	4.24E+04	8.66E+04	3.26E+04	3.93E+04	5.16E+04
2272.1	49.3	21	3.50E+05	5.02E+05	6.59E+05	2.38E+05	5.25E+05	4.39E+05	2.07E+05	3.25E+05	2.03E+05	1.17E+05	2.16E+05
1844.0	66.2	54	2.06E+05	4.21E+05	4.49E+05	1.23E+05	4.54E+05	4.60E+05	4.43E+04	2.75E+05	1.32E+05	6.49E+04	2.31E+05
2828.4	44.9	39	1.09E+06	2.02E+06	2.40E+06	7.61E+05	1.94E+06	1.73E+06	5.16E+05	1.42E+06	7.43E+05	3.62E+05	1.26E+06
2469.2	45.7	13	1.90E+05	3.12E+05	3.09E+05	1.22E+05	3.88E+05	3.78E+05	7.05E+04	1.91E+05	8.47E+04	6.51E+04	1.80E+05
1432.7	43.4	12	4.65E+05	3.25E+05	5.31E+05	2.01E+05	7.08E+05	6.35E+05	2.03E+05	4.48E+05	1.68E+05	1.71E+05	3.67E+05
1702.8	49.5	24	4.08E+05	6.05E+05	4.82E+05	2.16E+05	4.29E+05	4.68E+05	3.10E+05	3.02E+05	2.44E+05	1.42E+05	2.55E+05
2114.0	39.7	17	1.56E+05	2.06E+05	2.40E+05	6.91E+04	3.43E+05	2.99E+05	1.10E+05	1.99E+05	1.15E+05	6.04E+04	1.42E+05
2225.0	36.1	22	4.59E+05	6.14E+05	8.58E+05	1.97E+05	8.30E+05	7.78E+05	3.42E+05	4.07E+05	2.21E+05	1.90E+05	3.88E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.16E+05	3.26E+05	2.70E+05	4.18E+05	3.76E+05	3.46E+05	0.63	6.16E-01	1.60E-01	0.86	6.22E-01	4.62E-01	2.82E+05	2.41E+05
5.31E+05	6.50E+05	5.57E+05	6.73E+05	9.05E+05	5.97E+05	0.66	4.55E-01	6.19E-02	0.86	4.34E-01	2.89E-01	5.58E+05	4.77E+05
6.85E+04	7.34E+04	5.14E+04	1.23E+05	7.59E+04	5.84E+04	0.65	6.02E-01	1.19E-01	0.85	6.89E-01	4.50E-01	7.35E+04	6.28E+04
2.36E+05	2.67E+05	2.33E+05	3.22E+05	4.37E+05	3.78E+05	0.67	5.02E-01	6.66E-02	0.85	4.88E-01	3.20E-01	2.58E+05	2.20E+05
8.69E+05	1.43E+06	8.69E+05	2.05E+06	1.80E+06	1.61E+06	0.66	5.77E-01	9.08E-02	0.85	5.67E-01	3.54E-01	1.11E+06	9.42E+05
1.71E+05	2.79E+05	2.57E+05	4.14E+05	3.92E+05	3.69E+05	0.66	5.46E-01	7.37E-02	0.85	5.36E-01	3.17E-01	2.73E+05	2.32E+05
5.58E+04	9.31E+04	9.35E+04	1.18E+05	1.25E+05	1.06E+05	0.66	5.71E-01	1.50E-01	0.85	5.82E-01	4.47E-01	8.38E+04	7.13E+04
5.01E+05	1.05E+06	6.17E+05	1.15E+06	1.17E+06	1.73E+06	0.68	5.67E-01	7.17E-02	0.85	5.62E-01	3.28E-01	8.19E+05	6.97E+05
4.68E+04	5.42E+04	6.85E+04	1.21E+05	1.15E+05	8.72E+04	0.67	5.08E-01	4.91E-02	0.85	4.47E-01	2.25E-01	6.52E+04	5.54E+04
1.14E+05	1.59E+05	1.69E+05	3.18E+05	2.60E+05	2.30E+05	0.67	4.88E-01	3.77E-02	0.85	4.55E-01	2.29E-01	1.61E+05	1.36E+05
9.59E+04	5.79E+04	8.92E+04	1.68E+05	1.48E+05	8.96E+04	0.66	5.64E-01	7.80E-02	0.85	5.65E-01	3.34E-01	8.54E+04	7.25E+04
2.11E+05	2.97E+05	3.59E+05	4.79E+05	4.65E+05	3.71E+05	0.66	5.09E-01	6.45E-02	0.85	4.97E-01	2.95E-01	2.94E+05	2.50E+05
1.41E+05	1.28E+05	1.33E+05	2.10E+05	1.78E+05	1.49E+05	0.66	4.89E-01	7.28E-02	0.85	5.08E-01	3.31E-01	1.33E+05	1.13E+05
1.58E+05	1.98E+05	1.77E+05	2.76E+05	2.34E+05	2.08E+05	0.65	4.11E-01	2.74E-02	0.85	3.80E-01	1.82E-01	1.72E+05	1.46E+05
1.63E+05	3.27E+05	2.71E+05	5.31E+05	4.70E+05	3.85E+05	0.67	5.93E-01	9.08E-02	0.85	6.06E-01	3.61E-01	2.97E+05	2.52E+05
9.30E+04	1.82E+05	1.00E+05	1.54E+05	2.37E+05	2.40E+05	0.64	6.33E-01	1.42E-01	0.85	6.44E-01	4.29E-01	1.47E+05	1.25E+05
1.17E+05	1.15E+05	1.02E+05	1.87E+05	1.88E+05	2.02E+05	0.65	4.68E-01	5.04E-02	0.85	4.07E-01	2.22E-01	1.31E+05	1.11E+05
8.66E+05	1.58E+06	1.39E+06	2.10E+06	1.83E+06	2.20E+06	0.67	5.65E-01	8.17E-02	0.85	5.90E-01	3.52E-01	1.26E+06	1.06E+06
3.87E+04	5.99E+04	4.51E+04	9.22E+04	9.07E+04	5.30E+04	0.64	5.34E-01	6.58E-02	0.85	5.20E-01	3.03E-01	5.10E+04	4.32E+04
3.02E+04	4.35E+04	4.19E+04	7.95E+04	8.98E+04	5.88E+04	0.65	6.60E-01	1.55E-01	0.85	6.33E-01	4.19E-01	4.68E+04	3.96E+04
1.68E+05	2.34E+05	1.80E+05	4.72E+05	4.32E+05	2.40E+05	0.67	6.09E-01	8.99E-02	0.85	6.12E-01	3.55E-01	2.20E+05	1.86E+05
2.47E+05	1.63E+05	1.26E+05	2.58E+05	1.82E+05	2.06E+05	0.65	6.07E-01	1.23E-01	0.85	7.32E-01	4.55E-01	1.63E+05	1.37E+05
7.93E+05	8.86E+05	5.80E+05	1.32E+06	1.36E+06	9.63E+05	0.67	5.73E-01	9.37E-02	0.85	6.11E-01	3.74E-01	8.10E+05	6.85E+05
1.40E+05	1.65E+05	9.00E+04	1.91E+05	1.76E+05	1.59E+05	0.64	5.47E-01	9.32E-02	0.84	5.92E-01	3.71E-01	1.27E+05	1.08E+05
1.73E+05	2.71E+05	2.25E+05	3.03E+05	3.04E+05	2.99E+05	0.64	4.79E-01	6.40E-02	0.84	4.76E-01	2.88E-01	2.31E+05	1.95E+05
1.98E+05	2.91E+05	1.91E+05	3.24E+05	3.12E+05	3.46E+05	0.67	4.10E-01	2.30E-02	0.84	4.26E-01	2.18E-01	2.25E+05	1.90E+05
1.10E+05	9.31E+04	1.13E+05	1.72E+05	1.61E+05	1.70E+05	0.66	5.20E-01	7.61E-02	0.84	4.89E-01	2.84E-01	1.11E+05	9.35E+04
2.41E+05	3.70E+05	2.66E+05	3.96E+05	4.49E+05	3.93E+05	0.64	4.92E-01	6.86E-02	0.84	4.62E-01	2.76E-01	2.94E+05	2.48E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
124486955	Versican core protein	1	FENQTCFPLPDSR	Carbamidomethyl(6)Deamidated(3)	3.2	2	806.4
153792211	Ectonucleotide pyrophosphatase/phosphodiesterase family member 1	3	VYNGSVPFEER	Deamidated(3)	2.79	2	649.3
158711675	Protein CASC4	1	LQNNISYQMADIHHLK	Deamidated(4)Oxidation(9)	4.53	4	486.2
568915555	Integrin alpha V	4	TAADATGLQPILNQFTPANVSR	Deamidated(13)Deamidated(19)	5.68	3	763.1
568936862	Chemokine-like receptor 1	1	ITCFNNFSLAAPESPSPHPAHSQVVS TGYSR	Carbamidomethyl(3)Deamidated(6)	4.92	3	1088.2
568987063	stabilin-1	7	ELKGDGPFTVFVPHADLISNMSQDE LAR	Deamidated(20)Oxidation(21)	4.12	3	1035.2
226823283	Slit homolog 3 protein	2	DLEILTLNNNNISR	Deamidated(11)	4.27	2	815.4
568938103	Procollagen-lysine,2-oxoglutarate 5-dioxygenase 3	2	FLQSAEFFNYTVR	Deamidated(9)	3.42	2	811.9
89242146	Niemann Pick type C1	6	LIASNITETMR	Deamidated(5)Oxidation(10)	2.99	2	654.8
124487199	Chondroitin sulfate synthase	1	SLNSSEPLFLGQTGLGTTEEMGK	Deamidated(3)Oxidation(21)	4.51	3	805.1
226823283	Slit homolog 3 protein	2	SNLISCVSNDTFAGLSSVR	Carbamidomethyl(6)Deamidated(9)	4.56	2	1014.5
94363330	60S ribosomal protein L29-	1	SKNHHTTHNQSR	Deamidated(3)	2.62	2	656.3
13385294	prenylcysteine oxidase 1	2	GELNSTLFSSRPK	Deamidated(4)	3.81	2	718.9
568991301	Plexin B2	10	AMSNISVR	Deamidated(4)Oxidation(2)	2.47	2	447.7
755522163	Integrin alpha-M	8	AIVASENNMSR	Deamidated(8)Oxidation(9)	2.92	2	604.8
133778978	Cation-independent mannose-6-phosphate receptor	12	YMNYTSLITFHCK	Carbamidomethyl(12)Deamidated(3) Oxidation(2)	3.77	3	565.6
124494256	Prolow-density lipoprotein receptor-related protein 1	22	MHLNGSNVQVLHR	Deamidated(4)Oxidation(1)	3.94	2	761.4
594140550	Collagen type XII alpha-1	3	EAGNITTDGYEILGK	Deamidated(4)	4.52	2	791.4
255308873	Angiopoietin-related protein 4	1	MTQLIGLTPNATHLHRPPR	Deamidated(10)Oxidation(1)	3.72	3	724.1
268370173	Peroxidasin homolog	4	ILCDNSDNITR	Carbamidomethyl(3)Deamidated(8)	3.18	2	661.3
165377206	Translocon-associated protein subunit alpha	2	YPQDYQFYIQNFALPLNTVPPQR	Deamidated(11)	4.45	3	1004.8
133778978	Cation-independent mannose-6-phosphate receptor	12	AACAVRPQEVMTMVNGTLTNPVTGK	Carbamidomethyl(3)Deamidated(14) Oxidation(12)	7.47	3	844.4
33859809	Fibrinogen beta chain	2	YKGTAGNALMDGASQLVGENR	Carbamyl(2)Deamidated(20)Oxidation(10)	5.25	3	723.7
22203747	Collagen alpha-2(VI) chain	6	GTFTDCALANMTQQIR	Carbamidomethyl(6)Deamidated(10) Oxidation(11)	2.71	2	921.9
755534805	N-acetylglucosamine-1-phosphotransferase	4	NPSTNVSVVFDTTKDVDAHAGP FK	Deamidated(1)	4.88	4	694.6
6755144	Galectin-3-binding protein	3	APIPTALDTNSSK	Deamidated(10)	3.61	2	658.3
529250188	Angiotensin-converting	3	TFDVSNFQNSSIK	Deamidated(9)	3.34	2	744.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1611.7	41.7	14	7.52E+04	1.23E+05	1.61E+05	6.94E+04	2.89E+05	2.33E+05	9.72E+04	8.67E+04	1.11E+05	5.37E+04	7.40E+04
1297.6	35.0	16	1.20E+06	1.48E+06	1.86E+06	9.00E+05	1.41E+06	1.41E+06	6.29E+05	9.49E+05	5.02E+05	3.99E+05	8.67E+05
1941.9	28.4	4	9.66E+04	9.53E+04	1.11E+05	5.88E+04	1.20E+05	1.07E+05	5.02E+04	7.01E+04	2.62E+04	2.91E+04	5.81E+04
2287.2	51.6	94	1.78E+05	3.78E+05	3.95E+05	1.20E+05	3.54E+05	3.03E+05	1.06E+05	2.56E+05	1.08E+05	9.54E+04	1.74E+05
3262.5	38.7	9	1.97E+05	2.59E+05	4.12E+05	1.20E+05	3.34E+05	3.61E+05	1.47E+05	1.91E+05	9.08E+04	7.01E+04	2.18E+05
3103.5	51.1	23	4.23E+05	3.91E+05	9.17E+05	2.52E+05	7.58E+05	6.58E+05	1.58E+05	3.40E+05	2.25E+05	1.87E+05	2.52E+05
1629.8	52.1	16	2.81E+05	2.59E+05	2.73E+05	1.77E+05	4.14E+05	3.37E+05	1.75E+05	2.39E+05	1.52E+05	1.09E+05	2.27E+05
1622.8	52.3	28	7.32E+05	1.68E+06	1.71E+06	9.82E+05	2.18E+06	2.08E+06	4.85E+05	1.08E+06	7.86E+05	4.26E+05	9.96E+05
1308.6	50.4	20	1.46E+06	1.75E+06	2.04E+06	5.01E+05	2.15E+06	2.04E+06	1.35E+06	1.15E+06	6.22E+05	4.48E+05	1.07E+06
2413.1	50.3	22	1.61E+05	1.94E+05	2.40E+05	9.84E+04	2.10E+05	1.93E+05	7.33E+04	1.47E+05	7.22E+04	5.18E+04	1.01E+05
2028.0	53.5	15	6.41E+04	1.17E+05	2.11E+05	3.97E+04	1.90E+05	1.73E+05	6.72E+04	1.48E+05	7.79E+04	5.36E+04	1.16E+05
1311.6	15.7	2	2.59E+04	2.35E+04	0.00E+00	1.66E+02	4.38E+04	0.00E+00	6.62E+03	3.05E+04	4.53E+02	2.23E+02	1.63E+03
1436.7	34.6	25	3.95E+05	1.52E+05	4.31E+05	1.62E+05	5.96E+05	5.63E+05	1.31E+05	2.61E+05	1.33E+05	1.77E+05	1.59E+05
894.4	21.1	2	5.80E+05	4.60E+05	5.82E+05	1.91E+02	7.85E+05	7.29E+05	4.10E+05	3.92E+05	2.04E+05	1.16E+05	1.45E+05
1208.6	19.8	21	4.90E+05	5.42E+05	5.66E+05	4.89E+02	6.82E+05	6.19E+05	4.27E+05	4.08E+05	3.35E+05	1.25E+05	2.84E+05
1694.8	41.9	13	1.53E+05	1.80E+05	3.63E+05	9.07E+04	3.33E+05	2.95E+05	9.64E+04	1.47E+05	7.47E+04	6.50E+04	1.22E+05
1521.8	24.0	37	1.94E+06	1.81E+06	2.10E+06	3.10E+03	3.07E+06	2.73E+06	1.95E+06	1.42E+06	8.73E+05	5.75E+05	1.16E+06
1581.8	42.4	60	4.38E+06	5.08E+06	9.25E+06	4.83E+06	1.15E+07	1.01E+07	3.45E+06	6.64E+06	2.66E+06	3.34E+06	5.22E+06
2170.2	31.4	15	1.25E+05	2.58E+05	1.39E+05	9.49E+04	1.92E+05	1.39E+05	6.14E+04	5.29E+04	7.95E+04	3.19E+04	7.11E+04
1321.6	27.6	18	7.30E+05	6.71E+05	1.20E+06	3.78E+05	1.08E+06	9.09E+05	4.59E+05	4.63E+05	2.51E+05	2.79E+05	6.60E+05
3012.5	66.0	177	2.50E+06	3.65E+06	5.69E+06	1.57E+06	5.94E+06	5.24E+06	3.06E+05	4.25E+06	1.70E+06	8.63E+05	3.33E+06
2531.3	36.4	19	4.10E+05	5.49E+05	9.21E+05	2.19E+05	8.15E+05	8.18E+05	3.39E+05	3.77E+05	1.74E+05	1.91E+05	4.39E+05
2169.0	31.6	337	3.06E+05	2.79E+05	3.97E+05	5.95E+05	4.22E+05	2.85E+05	9.45E+04	2.35E+05	1.42E+05	1.85E+05	1.46E+05
1842.9	36.9	143	8.85E+06	8.43E+06	1.54E+07	6.52E+06	2.73E+07	2.59E+07	1.07E+07	1.15E+07	5.49E+06	5.60E+06	1.03E+07
2775.4	48.5	3	8.58E+04	4.42E+04	1.20E+05	4.39E+04	1.50E+05	1.24E+05	9.85E+03	3.18E+04	1.42E+04	2.69E+04	4.40E+04
1315.7	33.0	24	1.42E+06	1.04E+06	1.80E+06	6.08E+05	2.31E+06	2.18E+06	8.75E+05	1.07E+06	4.84E+05	4.55E+05	9.32E+05
1487.7	40.0	8	3.62E+05	2.73E+05	5.64E+05	2.73E+05	6.52E+05	6.02E+05	4.34E+05	3.38E+05	2.84E+05	1.55E+05	3.16E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
9.68E+04	1.03E+05	7.60E+04	1.26E+05	7.44E+04	1.02E+05	0.64	5.16E-01	9.01E-02	0.84	5.68E-01	3.45E-01	7.88E+04	6.64E+04
4.71E+05	8.63E+05	5.24E+05	8.25E+05	1.10E+06	9.81E+05	0.66	4.74E-01	3.88E-02	0.84	4.59E-01	2.27E-01	6.54E+05	5.50E+05
4.04E+04	5.01E+04	3.39E+04	6.88E+04	8.49E+04	5.71E+04	0.65	4.79E-01	3.73E-02	0.84	4.45E-01	2.12E-01	4.59E+04	3.86E+04
1.41E+05	1.87E+05	1.02E+05	1.96E+05	2.26E+05	1.53E+05	0.65	5.05E-01	7.42E-02	0.84	5.57E-01	3.49E-01	1.41E+05	1.18E+05
1.16E+05	1.58E+05	1.33E+05	1.35E+05	1.58E+05	2.10E+05	0.64	5.15E-01	6.55E-02	0.84	5.34E-01	3.00E-01	1.32E+05	1.11E+05
3.32E+05	1.91E+05	2.39E+05	4.81E+05	3.71E+05	2.64E+05	0.63	5.80E-01	1.03E-01	0.84	6.23E-01	3.73E-01	2.57E+05	2.15E+05
1.57E+05	1.13E+05	1.25E+05	2.47E+05	2.26E+05	1.31E+05	0.65	4.36E-01	2.13E-02	0.84	4.16E-01	1.66E-01	1.47E+05	1.23E+05
7.59E+05	8.74E+05	6.33E+05	1.14E+06	8.63E+05	1.06E+06	0.65	4.89E-01	6.61E-02	0.84	4.91E-01	2.80E-01	7.43E+05	6.23E+05
6.73E+05	8.63E+05	7.92E+05	1.44E+06	1.13E+06	1.12E+06	0.65	4.87E-01	4.73E-02	0.84	4.55E-01	2.23E-01	8.21E+05	6.89E+05
8.84E+04	9.81E+04	9.22E+04	1.30E+05	1.17E+05	1.23E+05	0.65	4.17E-01	3.33E-02	0.84	4.10E-01	2.10E-01	8.84E+04	7.41E+04
5.45E+04	6.32E+04	5.06E+04	1.08E+05	1.05E+05	9.11E+04	0.66	5.70E-01	1.03E-01	0.84	5.86E-01	3.56E-01	7.03E+04	5.87E+04
9.72E+03	2.15E+04	1.88E+02	5.25E+03	3.67E+04	3.43E+03	0.68	1.66E+00	5.21E-01	0.84	1.96E+00	7.57E-01	8.39E+03	7.01E+03
1.66E+05	1.53E+05	1.86E+05	3.16E+05	2.63E+05	1.31E+05	0.62	5.68E-01	9.98E-02	0.84	6.09E-01	3.61E-01	1.74E+05	1.45E+05
2.22E+05	3.35E+05	2.71E+05	5.25E+05	3.88E+05	3.81E+05	0.65	6.46E-01	1.14E-01	0.84	6.70E-01	3.76E-01	2.60E+05	2.17E+05
2.69E+05	2.52E+05	2.39E+05	4.96E+05	3.88E+05	3.73E+05	0.67	5.48E-01	7.87E-02	0.83	5.55E-01	3.02E-01	2.65E+05	2.21E+05
1.01E+05	1.36E+05	9.23E+04	1.48E+05	1.69E+05	1.35E+05	0.63	5.32E-01	9.35E-02	0.83	5.21E-01	3.18E-01	1.07E+05	8.92E+04
9.00E+05	1.14E+06	8.99E+05	1.65E+06	1.25E+06	1.52E+06	0.64	5.34E-01	8.55E-02	0.83	5.05E-01	2.84E-01	1.00E+06	8.35E+05
2.75E+06	5.03E+06	2.18E+06	3.15E+06	5.47E+06	5.28E+06	0.63	5.14E-01	6.23E-02	0.83	5.35E-01	2.80E-01	3.61E+06	3.01E+06
1.91E+05	4.23E+04	4.77E+04	5.90E+04	7.62E+04	1.17E+05	0.63	7.35E-01	1.19E-01	0.83	1.07E+00	5.66E-01	7.29E+04	6.08E+04
3.00E+05	4.69E+05	2.95E+05	4.21E+05	4.34E+05	5.50E+05	0.62	4.96E-01	5.44E-02	0.83	5.06E-01	2.54E-01	3.79E+05	3.16E+05
1.63E+06	2.09E+06	1.65E+06	2.80E+06	2.97E+06	2.65E+06	0.66	6.28E-01	1.36E-01	0.83	6.67E-01	4.02E-01	1.97E+06	1.64E+06
2.06E+05	3.24E+05	2.35E+05	3.43E+05	4.27E+05	4.25E+05	0.63	5.40E-01	8.32E-02	0.83	5.26E-01	2.99E-01	2.85E+05	2.37E+05
3.15E+05	1.51E+05	1.25E+05	2.46E+05	1.81E+05	1.27E+05	0.60	5.13E-01	5.02E-02	0.83	6.89E-01	3.70E-01	1.72E+05	1.43E+05
5.03E+06	7.22E+06	6.90E+06	9.90E+06	9.78E+06	1.20E+07	0.62	5.64E-01	1.08E-01	0.83	5.17E-01	3.10E-01	7.37E+06	6.12E+06
4.48E+04	2.75E+04	3.32E+04	5.37E+04	7.31E+04	2.65E+04	0.59	6.80E-01	1.55E-01	0.83	7.79E-01	4.70E-01	3.69E+04	3.06E+04
5.36E+05	8.49E+05	6.02E+05	1.18E+06	1.02E+06	1.02E+06	0.63	5.18E-01	6.78E-02	0.83	4.76E-01	2.37E-01	7.28E+05	6.03E+05
1.89E+05	2.49E+05	2.76E+05	3.98E+05	3.22E+05	2.46E+05	0.64	4.12E-01	2.05E-02	0.83	3.71E-01	1.12E-01	2.40E+05	1.99E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568996104	Coiled-coil domain-containing protein 80	1	ISVVTIFGPVNNSSMK	Deamidated(12)Oxidation(15)	3.64	2	855.4
568920948	Protocadherin Fat 4	3	YQNVSGFSNVNINR	Deamidated(3)	3.8	2	806.9
568920137	Laminin subunit alpha-5	15	IVPLENGEIVVSLVNGRPGALNFSYS PLLK	Deamidated(6)Deamidated(15)Deamidated(22)	3.64	3	1076.3
224922773	Olfactomedin-like protein 2B	2	NANISYAFDTHNTQIVPR	Deamidated(3)	5.97	3	721.7
568995622	Target of Nesh-SH3	2	SIQITNQTFSTVENLKPDTSYEFQVK PK	Deamidated(6)	5.41	4	811.7
23956366	Peptidyl-prolyl cis-trans isomerase FKBP14	1	HGAVVNESHHDALVEDIFDKEDEDK DGFISAR	Deamidated(6)	9.41	5	719.9
31981716	Histocompatibility 2, class II antigen A, alpha	1	RSNSTPATNEAPQATVFPK	Deamidated(3)	5.08	3	673.0
122937370	Multimerin-2	4	QVEELLVNHTGLR	Deamidated(8)	2.99	2	754.9
568934359	protocadherin 7	1	IDNLTGELSTSER	Deamidated(3)	3.89	2	718.4
568926396	Tenascin	12	NFFIQVLEADTTQTQVQLTVPGGLR	Deamidated(1)Deamidated(17)	3.12	2	1381.7
568941620	Glucoside xylosyltransferase 2	2	HPFYGSAGVNSGVMLMNLTR	Deamidated(17)Oxidation(14)Oxidation(16)	5.98	3	728.7
568976251	Microfibril-associated glycoprotein 4	2	RFNGSVSFFR	Deamidated(3)	3.33	2	609.3
755546876	Interleukin-3 receptor subunit alpha	1	FHHGLLGYTLQVNQSSR	Deamidated(13)	5.47	3	653.3
754170702	Ectonucleoside triphosphate diphosphohydrolase 1	2	VNVSELYGTPCTK	Carbamidomethyl(12)Deamidated(3)	3.54	2	784.4
6753484	Collagen alpha-1(VI) chain	5	ENYAELDDGFLKNITAIQICIDK	Carbamidomethyl(20)Deamidated(14)	5.68	3	895.4
568908031	Prolargin	3	IHYLYLQNNFITEPLESFQATGLR	Deamidated(21)	8.08	3	1032.5
568923623	Translocon-associated protein subunit beta	2	AGYFNFTSATITYLAQEDGPVVIGST SAPGQGGILAQR	Deamidated(5)	6.57	3	1287.0
568972029	C-type mannose receptor 2	6	GTDPSPSPAAATPPAPGAELSYLN HTFR	Deamidated(25)	7.53	3	984.8
10946680	Fibromodulin	3	LYLDHNNLTR	Deamidated(6)Deamidated(7)	3.97	3	420.6
133778978	Cation-independent mannose-6-phosphate receptor	12	TQYACPPFNVTECSVQDAAGNSIDL SSLSR	Carbamidomethyl(5)Carbamidomethyl(13)Deamidated(9)	3.87	3	1096.8
167555029	Fibrinogen, alpha polypeptide	1	MDGSLNFNR	Deamidated(8)Oxidation(1)	2.63	2	535.7
150378458	Disintegrin and metalloproteinase domain-containing protein 10	1	INTTSDEKDPTNPFR	Deamidated(2)	5.02	3	579.3
568915418	Prolyl endopeptidase FAP	4	DDNLEHYKNSTVMAR	Deamidated(9)Oxidation(13)	4.41	3	603.9
31982236	Integrin alpha 6	3	YQTLNCSVNVR	Carbamidomethyl(6)Deamidated(5)	2.75	2	677.8
568917853	Calcitonin gene-related peptide type 1 receptor	1	IMQDPIQQAEGLYCNR	Carbamidomethyl(14)Deamidated(15)Oxidation(2)	4.17	2	976.9

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1709.9	51.5	26	3.72E+05	7.87E+05	5.74E+05	3.12E+05	6.31E+05	5.24E+05	1.85E+05	3.42E+05	2.10E+05	2.41E+05	3.29E+05
1612.8	36.2	9	5.55E+04	7.32E+04	9.80E+04	3.24E+04	1.19E+05	1.15E+05	4.29E+04	7.16E+04	3.26E+04	3.21E+04	3.72E+04
3226.7	67.5	4	4.36E+04	6.13E+04	2.30E+05	2.09E+04	7.29E+04	6.91E+04	1.43E+04	7.97E+04	9.91E+03	5.93E+03	3.02E+04
2163.0	39.5	15	1.27E+05	1.96E+05	2.08E+05	1.06E+05	2.13E+05	2.00E+05	3.49E+04	1.62E+05	6.31E+04	4.14E+04	1.25E+05
3243.6	46.7	12	9.24E+04	1.20E+05	2.65E+05	1.70E+05	2.54E+05	2.74E+05	3.63E+04	2.57E+05	7.73E+04	6.50E+04	2.30E+05
3595.7	39.7	25	6.79E+04	1.45E+05	1.40E+05	8.05E+04	1.66E+05	1.61E+05	3.00E+04	5.16E+04	5.96E+04	2.72E+04	5.03E+04
2017.0	30.0	3	1.45E+05	7.20E+04	1.07E+05	5.90E+04	9.80E+04	8.92E+04	5.01E+04	8.66E+04	2.41E+04	2.72E+04	8.21E+04
1508.8	37.1	12	1.29E+05	1.27E+05	1.58E+05	5.69E+04	2.57E+05	2.05E+05	5.50E+04	6.75E+04	4.56E+04	5.42E+04	9.63E+04
1435.7	36.0	1	2.87E+05	3.79E+05	4.18E+05	2.45E+05	5.60E+05	5.29E+05	1.90E+05	3.37E+05	1.68E+05	1.46E+05	2.58E+05
2762.4	74.2	145	1.06E+06	1.11E+05	1.96E+05	1.73E+06	7.45E+04	1.67E+06	8.04E+03	3.56E+06	6.74E+05	3.38E+05	7.16E+05
2184.0	39.0	32	3.85E+05	3.90E+05	5.02E+05	3.04E+05	5.74E+05	5.81E+05	1.37E+05	4.41E+05	1.50E+05	1.35E+05	3.34E+05
1217.6	37.8	21	7.16E+05	8.55E+05	1.74E+06	6.18E+05	2.83E+06	2.82E+06	7.39E+05	1.28E+06	5.06E+05	6.16E+05	6.47E+05
1958.0	34.7	10	1.13E+05	4.59E+04	1.66E+05	9.33E+04	4.03E+05	3.53E+05	1.27E+05	1.63E+05	8.77E+04	5.39E+04	1.16E+05
1567.8	39.3	11	6.84E+05	7.33E+05	1.05E+06	4.97E+05	1.32E+06	1.17E+06	6.70E+05	5.99E+05	4.45E+05	2.79E+05	6.62E+05
2684.3	66.5	21	2.03E+05	2.33E+05	7.74E+05	1.71E+05	4.87E+05	4.69E+05	8.56E+04	3.75E+05	5.33E+04	3.20E+04	6.75E+04
3095.6	65.0	64	2.17E+05	2.73E+05	5.27E+05	1.72E+05	4.00E+05	3.13E+05	6.19E+04	3.47E+05	5.29E+04	2.75E+04	6.81E+04
3858.9	69.8	73	6.59E+05	8.71E+05	1.43E+06	3.68E+05	9.55E+05	8.13E+05	6.10E+03	8.96E+05	2.93E+05	1.75E+05	5.91E+05
2952.4	50.4	45	4.38E+06	8.07E+06	7.75E+06	3.53E+06	6.54E+06	6.28E+06	2.44E+06	4.71E+06	2.93E+06	1.65E+06	3.28E+06
1259.6	29.8	70	2.73E+05	3.42E+05	7.40E+05	2.45E+05	7.15E+05	6.58E+05	1.93E+05	3.45E+05	9.16E+04	1.62E+05	3.12E+05
3288.5	55.5	10	9.43E+04	1.93E+05	2.76E+05	6.72E+04	2.21E+05	2.17E+05	4.70E+04	1.12E+05	5.36E+04	4.47E+04	1.25E+05
1070.5	27.5	12	3.09E+05	5.32E+05	4.98E+05	9.91E+05	5.32E+05	4.92E+05	2.42E+05	3.70E+05	2.97E+05	3.02E+05	3.06E+05
1735.8	29.3	34	5.15E+05	4.41E+05	7.25E+05	2.44E+05	9.04E+05	8.08E+05	4.33E+05	4.81E+05	2.49E+05	1.80E+05	3.62E+05
1809.8	23.8	9	9.06E+04	1.10E+05	1.10E+05	0.00E+00	1.10E+05	1.15E+05	7.72E+04	6.79E+04	4.68E+04	2.42E+04	6.39E+04
1354.6	30.2	11	3.19E+05	2.98E+05	3.92E+05	1.01E+05	5.75E+05	5.31E+05	2.70E+05	2.42E+05	1.46E+05	1.48E+05	2.26E+05
1952.9	42.4	14	7.92E+04	7.35E+04	1.40E+05	3.36E+04	1.95E+05	1.63E+05	6.80E+04	6.26E+04	3.29E+04	3.19E+04	8.76E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.38E+05	2.80E+05	2.06E+05	3.09E+05	2.85E+05	3.29E+05	0.63	3.98E-01	4.70E-02	0.83	4.56E-01	2.80E-01	2.51E+05	2.08E+05
4.04E+04	4.25E+04	3.32E+04	5.68E+04	6.01E+04	5.86E+04	0.63	4.62E-01	5.31E-02	0.83	4.22E-01	2.15E-01	4.03E+04	3.34E+04
2.28E+04	1.50E+04	4.19E+04	9.57E+04	9.10E+04	5.17E+04	0.66	1.16E+00	3.88E-01	0.83	1.32E+00	6.47E-01	3.74E+04	3.09E+04
7.20E+04	8.73E+04	5.89E+04	1.16E+05	1.09E+05	1.51E+05	0.65	5.49E-01	7.06E-02	0.83	5.74E-01	3.03E-01	8.35E+04	6.91E+04
3.64E+04	1.22E+05	7.51E+04	1.07E+05	1.39E+05	1.20E+05	0.65	6.94E-01	1.31E-01	0.83	8.31E-01	4.55E-01	9.86E+04	8.16E+04
6.06E+04	6.41E+04	5.16E+04	1.10E+05	8.23E+04	6.21E+04	0.63	5.77E-01	8.61E-02	0.83	6.14E-01	3.29E-01	5.66E+04	4.68E+04
1.49E+04	5.58E+04	3.63E+04	7.82E+04	8.19E+04	4.60E+04	0.65	6.03E-01	7.69E-02	0.83	6.82E-01	3.59E-01	4.61E+04	3.81E+04
7.32E+04	5.83E+04	5.29E+04	1.04E+05	7.88E+04	7.67E+04	0.61	5.23E-01	9.27E-02	0.83	5.36E-01	3.07E-01	6.71E+04	5.54E+04
2.04E+05	2.16E+05	2.11E+05	2.42E+05	2.31E+05	2.22E+05	0.63	3.48E-01	2.43E-02	0.83	3.50E-01	1.36E-01	1.97E+05	1.62E+05
6.89E+05	7.17E+05	4.18E+05	1.29E+06	1.06E+05	1.56E+06	0.72	1.32E+00	5.24E-01	0.83	1.53E+00	7.12E-01	6.48E+05	5.35E+05
1.12E+05	2.58E+05	1.72E+05	2.76E+05	3.72E+05	3.33E+05	0.65	5.31E-01	5.50E-02	0.82	5.39E-01	2.55E-01	2.19E+05	1.80E+05
4.43E+05	8.06E+05	7.20E+05	1.45E+06	1.21E+06	7.56E+05	0.62	6.69E-01	1.48E-01	0.82	6.94E-01	3.98E-01	7.40E+05	6.10E+05
7.43E+04	1.26E+05	1.49E+05	5.85E+04	6.48E+04	1.95E+05	0.61	7.27E-01	1.58E-01	0.82	8.27E-01	4.51E-01	9.52E+04	7.84E+04
3.47E+05	5.54E+05	3.68E+05	6.43E+05	6.03E+05	5.72E+05	0.63	4.32E-01	2.64E-02	0.82	3.71E-01	1.02E-01	4.50E+05	3.71E+05
7.92E+04	7.50E+04	2.92E+05	3.37E+05	4.49E+05	3.13E+05	0.65	9.77E-01	2.64E-01	0.82	1.13E+00	5.69E-01	1.75E+05	1.44E+05
6.87E+04	7.90E+04	1.56E+05	3.94E+05	3.62E+05	2.43E+05	0.67	9.36E-01	2.43E-01	0.82	1.06E+00	5.36E-01	1.48E+05	1.21E+05
3.25E+05	3.66E+05	2.74E+05	6.90E+05	7.10E+05	5.41E+05	0.66	6.85E-01	1.55E-01	0.82	7.34E-01	4.11E-01	4.04E+05	3.31E+05
2.56E+06	3.32E+06	2.54E+06	4.89E+06	4.73E+06	3.97E+06	0.65	4.76E-01	4.06E-02	0.82	4.82E-01	2.18E-01	3.00E+06	2.46E+06
8.59E+04	4.75E+05	9.46E+04	1.67E+05	3.07E+05	3.42E+05	0.61	7.08E-01	1.18E-01	0.82	8.66E-01	4.46E-01	2.19E+05	1.79E+05
5.29E+04	1.05E+05	6.90E+04	1.10E+05	1.18E+05	8.57E+04	0.62	5.87E-01	1.07E-01	0.82	6.36E-01	3.47E-01	7.97E+04	6.51E+04
4.05E+05	2.49E+05	2.32E+05	3.43E+05	2.08E+05	2.46E+05	0.60	4.23E-01	3.81E-02	0.82	5.82E-01	2.67E-01	2.71E+05	2.21E+05
2.57E+05	3.20E+05	3.16E+05	4.27E+05	4.12E+05	3.85E+05	0.62	4.29E-01	3.57E-02	0.82	3.68E-01	1.27E-01	3.01E+05	2.45E+05
3.93E+04	4.99E+04	4.19E+04	5.83E+04	6.02E+04	7.90E+04	0.64	5.15E-01	6.53E-02	0.81	5.08E-01	2.40E-01	4.68E+04	3.81E+04
1.67E+05	2.20E+05	1.65E+05	2.10E+05	2.57E+05	1.58E+05	0.61	4.26E-01	4.76E-02	0.81	4.20E-01	1.73E-01	1.79E+05	1.45E+05
3.83E+04	5.30E+04	4.73E+04	5.57E+04	8.46E+04	5.77E+04	0.61	5.83E-01	9.99E-02	0.81	5.81E-01	2.94E-01	5.15E+04	4.19E+04

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Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
569001628	Inactive tyrosine-protein kinase 7	3	AVVFANGSLLLTQVRPR	Deamidated(6)	4.72	3	614.7
568971816	Intercellular adhesion molecule 2	6	INCSTNCAAPDMGGLETPTNK	Carbamidomethyl(3)Carbamidomethyl(7)Deamidated(2)Oxidation(12)	3.17	3	756.7
170784829	Procollagen galactosyltransferase 1	2	AMNTSQVEAMGIQMLPGYR	Deamidated(3)Oxidation(2)Oxidation(10)Oxidation(14)	4.45	2	1073.5
6753066	Membrane primary amine oxidase	2	YLYLASNHSNK	Deamidated(7)	2.61	2	655.8
165932373	Collectin-12	4	SKLDTEVANLSVVMEEK	Deamidated(9)Oxidation(14)Oxidation(17)	4.45	3	686.0
164565411	Collagen alpha-1(V)	3	KNVTLILDCK	Carbamidomethyl(9)Deamidated(2)	3.46	2	602.8
568931034	Endothelin-converting enzyme 1	3	QVSTLINNTDK	Deamidated(7)	3.1	2	617.3
568915555	Integrin alpha V	4	ENQNHSYSLK	Deamidated(4)	3.11	2	610.8
568947434	Aminopeptidase N	9	NATLVNEADKLR	Deamidated(1)	2.99	2	672.9
755498697	Fibrillin-1	5	NYADNQTCDGELLFNMTK	Carbamidomethyl(9)Deamidated(1)Deamidated(6)Deamidated(16)Oxidation(17)	4.47	2	1157.5
568909422	hemocentin 1	2	GANSDLPEEVTVLVNK	Deamidated(15)	3.17	2	843.4
117606385	Protein disulfide-isomerase TMX3	1	LVAIAVIDEKNTSLEHTR	Deamidated(11)	6.21	3	670.7
124494256	Prolow-density lipoprotein receptor-related protein 1	22	DNATDSVPLR	Deamidated(2)	2.74	2	544.8
225903442	Integrin alpha-5	6	HPGNFSSLSCDYFAVNQSR	Carbamidomethyl(10)Deamidated(4)Deamidated(16)	5.41	3	730.0
568987063	stabilin-1	7	NVTAASAEFGYK	Deamidated(1)	3.1	2	629.8
568987678	Gamma-sarcoglycan	2	SRVDSSLLQSTQNVTVSAR	Deamidated(14)	5.29	3	721.4
120407045	Matrilin-2	1	AIGSEPHKDHVFLVANFSQIESLTSVFQNK	Deamidated(16)	5.19	4	836.7
568909511	ER degradation-enhancing alpha-mannosidase-like protein 3	1	LLPAFNNTSGLPYPR	Deamidated(6)	3.4	2	824.4
6680878	Lysosome membrane protein	7	ANIQFGENGTTISAVTNK	Deamidated(8)	4.14	2	933.5
124494256	Prolow-density lipoprotein receptor-related protein 1	22	VNRFNSTEYQVVTR	Deamidated(5)	3.78	3	572.0
124494256	Prolow-density lipoprotein receptor-related protein 1	22	LNGTDPIVAADSK	Deamidated(2)	3.87	2	651.3
568926396	Tenascin	12	HFVVQVQEANNVEAAQNLTVPGLSR	Deamidated(17)	8.14	3	907.8
124286805	Complement C1q subcomponent subunit A	1	VLTNQESPYQNHTGR	Deamidated(11)	5.75	3	582.3

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MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1842.1	48.9	7	3.43E+05	5.59E+05	8.25E+05	3.45E+05	6.52E+05	4.94E+05	1.48E+05	5.40E+05	2.44E+05	9.11E+04	4.21E+05
2268.0	28.5	8	8.62E+04	3.62E+04	1.21E+05	2.62E+04	1.68E+05	1.39E+05	6.08E+04	4.73E+04	2.58E+04	3.01E+04	7.94E+04
2146.0	38.1	60	1.73E+06	2.21E+06	2.70E+06	1.53E+06	3.14E+06	3.03E+06	1.27E+06	2.01E+06	1.09E+06	9.21E+05	1.30E+06
1310.6	26.5	18	1.09E+06	5.86E+05	5.60E+05	2.67E+04	9.34E+05	7.60E+05	4.12E+05	4.23E+05	2.57E+05	1.61E+05	3.36E+05
2056.0	37.8	8	3.15E+05	3.51E+05	4.16E+05	1.47E+05	4.66E+05	4.34E+05	1.83E+05	3.08E+05	1.37E+05	9.81E+04	2.07E+05
1204.7	31.3	10	1.11E+05	9.00E+04	1.75E+05	3.22E+04	2.64E+05	2.37E+05	5.77E+04	7.30E+04	2.13E+04	6.38E+04	7.97E+04
1233.6	28.8	13	1.67E+05	1.44E+05	1.61E+05	9.61E+04	2.44E+05	2.14E+05	1.32E+05	1.17E+05	7.71E+04	4.53E+04	8.09E+04
1220.6	19.4	10	3.12E+05	2.77E+05	3.12E+05	2.38E+03	3.81E+05	1.75E+04	2.72E+05	1.84E+05	6.97E+04	5.12E+04	1.10E+05
1344.7	32.8	25	4.70E+05	6.02E+05	5.68E+05	2.13E+05	5.52E+05	5.51E+05	3.55E+05	3.71E+05	1.94E+05	1.37E+05	2.40E+05
2314.0	43.7	278	4.65E+06	5.14E+06	9.42E+06	3.38E+06	1.39E+07	1.32E+07	5.71E+06	6.57E+06	2.10E+06	3.26E+06	5.89E+06
1685.9	48.4	4	8.85E+04	6.35E+04	3.14E+05	2.79E+05	1.75E+05	1.95E+05	1.45E+05	6.48E+04	3.76E+04	5.37E+04	2.18E+04
2010.1	37.0	38	1.20E+06	1.18E+06	1.95E+06	6.25E+05	2.08E+06	1.97E+06	4.72E+05	1.06E+06	4.84E+05	4.98E+05	9.51E+05
1088.5	29.6	16	2.82E+05	2.52E+05	2.87E+05	1.61E+05	4.20E+05	3.78E+05	2.50E+05	2.50E+05	1.63E+05	8.44E+04	1.57E+05
2187.9	44.0	17	2.53E+05	3.54E+05	4.78E+05	1.42E+05	5.58E+05	4.48E+05	2.27E+05	2.76E+05	1.82E+05	9.61E+04	2.59E+05
1258.6	38.5	9	1.01E+05	6.14E+04	1.23E+05	4.03E+04	1.42E+05	1.52E+05	7.54E+04	7.77E+04	5.24E+04	2.77E+04	4.57E+04
2162.1	40.4	11	1.54E+05	4.93E+04	2.02E+05	7.19E+04	2.54E+05	2.45E+05	1.43E+03	1.05E+05	4.08E+04	6.56E+04	9.52E+04
3343.7	56.7	6	5.51E+04	1.05E+05	1.85E+05	9.23E+04	1.87E+05	1.04E+05	1.03E+04	1.56E+05	4.61E+04	3.26E+04	5.10E+04
1647.9	51.3	21	2.12E+05	3.48E+05	4.96E+05	1.79E+05	5.61E+05	4.76E+05	1.97E+05	4.08E+05	2.52E+05	9.55E+04	2.87E+05
1865.9	39.7	40	2.20E+06	2.66E+06	3.37E+06	1.33E+06	4.20E+06	4.07E+06	1.42E+06	2.75E+06	1.17E+06	9.79E+05	2.18E+06
1713.9	30.4	2	1.32E+05	6.66E+04	1.02E+05	9.37E+04	1.63E+05	1.49E+05	5.26E+04	6.14E+04	5.17E+04	3.68E+04	9.20E+04
1301.7	31.9	22	1.35E+06	1.88E+06	2.28E+06	9.24E+05	2.04E+06	1.75E+06	1.35E+06	1.25E+06	7.06E+05	4.53E+05	9.04E+05
2721.4	44.9	347	9.15E+04	5.90E+04	1.14E+05	9.18E+04	1.30E+05	1.92E+05	3.76E+04	1.27E+05	4.50E+04	4.00E+04	1.31E+05
1744.8	21.9	100	1.07E+05	4.60E+04	1.33E+05	0.00E+00	2.24E+05	2.11E+05	5.21E+04	7.81E+04	1.30E+04	2.74E+04	3.12E+04

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Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.48E+05	2.70E+05	1.77E+05	4.49E+05	4.05E+05	3.37E+05	0.65	5.72E-01	7.49E-02	0.81	6.20E-01	2.97E-01	2.67E+05	2.17E+05
2.63E+04	3.94E+04	4.84E+04	5.33E+04	5.41E+04	4.44E+04	0.60	6.06E-01	1.15E-01	0.81	6.58E-01	3.50E-01	4.26E+04	3.47E+04
9.67E+05	1.19E+06	1.21E+06	1.58E+06	1.92E+06	1.35E+06	0.63	3.84E-01	1.68E-02	0.81	3.17E-01	8.10E-02	1.19E+06	9.67E+05
2.01E+05	2.82E+05	3.27E+05	5.00E+05	4.66E+05	5.97E+05	0.64	6.47E-01	1.27E-01	0.81	6.49E-01	3.42E-01	3.18E+05	2.59E+05
1.34E+05	1.39E+05	1.79E+05	2.54E+05	2.65E+05	2.87E+05	0.64	4.86E-01	3.96E-02	0.81	4.49E-01	1.68E-01	1.75E+05	1.42E+05
6.85E+04	6.29E+04	3.26E+04	6.62E+04	7.62E+04	9.76E+04	0.58	5.89E-01	1.35E-01	0.81	6.84E-01	4.03E-01	6.30E+04	5.12E+04
8.44E+04	7.03E+04	9.17E+04	1.58E+05	1.18E+05	1.04E+05	0.63	4.48E-01	2.07E-02	0.81	3.94E-01	9.72E-02	8.50E+04	6.91E+04
9.15E+04	1.20E+05	1.08E+05	1.96E+05	1.79E+05	1.82E+05	0.64	6.93E-01	1.74E-01	0.81	7.17E-01	4.08E-01	1.16E+05	9.40E+04
1.45E+05	2.47E+05	1.84E+05	5.04E+05	4.90E+05	2.79E+05	0.65	5.66E-01	5.29E-02	0.81	5.69E-01	2.35E-01	2.47E+05	2.00E+05
2.35E+06	5.21E+06	2.86E+06	4.53E+06	5.92E+06	4.27E+06	0.60	5.45E-01	8.38E-02	0.81	5.73E-01	2.82E-01	3.91E+06	3.17E+06
1.08E+05	6.71E+04	4.51E+04	9.63E+04	1.32E+05	1.98E+05	0.60	7.58E-01	1.34E-01	0.81	8.77E-01	4.39E-01	8.11E+04	6.57E+04
6.15E+05	6.05E+05	6.02E+05	1.08E+06	9.34E+05	7.07E+05	0.61	4.94E-01	6.35E-02	0.81	4.79E-01	2.22E-01	6.84E+05	5.54E+05
1.21E+05	1.78E+05	1.34E+05	2.72E+05	2.29E+05	2.09E+05	0.64	4.29E-01	1.57E-02	0.81	3.74E-01	7.88E-02	1.56E+05	1.26E+05
1.42E+05	2.10E+05	1.72E+05	2.47E+05	2.89E+05	2.14E+05	0.63	4.76E-01	4.30E-02	0.81	4.41E-01	1.54E-01	1.85E+05	1.49E+05
5.60E+04	4.58E+04	4.42E+04	1.03E+05	8.24E+04	5.42E+04	0.63	5.35E-01	4.84E-02	0.81	5.22E-01	1.96E-01	5.20E+04	4.21E+04
8.59E+04	4.73E+04	3.33E+04	1.19E+05	9.02E+04	5.01E+04	0.59	6.69E-01	1.46E-01	0.81	8.01E-01	4.25E-01	6.80E+04	5.49E+04
3.62E+04	4.40E+04	4.27E+04	1.16E+05	1.32E+05	9.16E+04	0.65	7.65E-01	1.70E-01	0.81	8.14E-01	4.12E-01	6.01E+04	4.85E+04
2.15E+05	1.94E+05	1.92E+05	3.31E+05	2.39E+05	2.24E+05	0.64	4.66E-01	3.88E-02	0.81	5.14E-01	2.13E-01	2.03E+05	1.64E+05
1.27E+06	1.45E+06	1.24E+06	2.11E+06	1.86E+06	1.68E+06	0.62	4.45E-01	3.79E-02	0.81	4.33E-01	1.65E-01	1.46E+06	1.18E+06
3.87E+04	4.15E+04	3.81E+04	1.00E+05	8.46E+04	4.62E+04	0.62	5.54E-01	4.89E-02	0.81	5.31E-01	1.93E-01	5.42E+04	4.36E+04
6.23E+05	8.58E+05	7.00E+05	1.45E+06	1.46E+06	1.18E+06	0.63	4.70E-01	2.42E-02	0.81	4.27E-01	1.15E-01	8.58E+05	6.91E+05
1.19E+04	4.41E+04	4.90E+04	3.61E+04	1.02E+05	8.90E+04	0.64	7.20E-01	1.17E-01	0.80	8.14E-01	3.84E-01	5.62E+04	4.52E+04
9.04E+04	5.25E+04	3.44E+04	5.82E+04	7.41E+04	7.08E+04	0.57	7.16E-01	1.74E-01	0.80	9.35E-01	4.81E-01	5.13E+04	4.12E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
166064058	Slit homolog 2 protein	2	LDLNGNNITR	Deamidated(4)Deamidated(7)	2.75	2	566.3
568938765	Carbohydrate sulfotransferase 12	2	EHVHNTSTHLTFNK	Deamidated(5)	3.75	3	555.9
568942782	Anthrax toxin receptor 1	1	DFNETQLAR	Deamidated(3)	2.47	2	547.8
568991301	Plexin B2	10	SCVAITDAFPQNMSR	Carbamidomethyl(2)Deamidated(12) Oxidation(13)	3.69	2	857.4
568998058	Transmembrane protein 181	1	VIETLPANYSLNSSK	Deamidated(8)	3.89	2	818.9
569001313	Equilibrative nucleoside transporter 1	1	LDVSNQVSSDTDQSCESTK	Carbamidomethyl(15)Deamidated(6)	5.47	2	1050.9
294997230	Histocompatibility 2, class II antigen A, beta 1	1	HFVYQFMGECYFTNGTQR	Carbamidomethyl(10)Deamidated(14) Oxidation(7)	5.48	3	768.0
568972029	C-type mannose receptor 2	6	VTPVCNASLPAQR	Carbamidomethyl(5)Deamidated(6)	3.18	2	707.4
755522163	Integrin alpha-M	8	LNVTLVGEPLR	Deamidated(2)	3.1	2	638.4
568939628	Serum paraoxonase/lactonase 3	1	VSTLYANNGSVLQGSTVASVYHK	Deamidated(7)Deamidated(8)	7.19	3	799.4
46849812	Fibronectin	10	LDAPTNLQFVNETDR	Deamidated(11)	4.42	2	867.4
568926396	Tenascin	12	QTGLAPGQEYEISLHIVKNNTR	Deamidated(19)	5.07	4	618.1
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	YHYNGTLLDGTAFDNSYSR	Deamidated(4)	6.84	3	732.3
170763511	Platelet-derived growth factor receptor-like protein	1	EIPANGTDIVYDMK	Deamidated(5)Oxidation(13)	3.45	2	791.9
31542362	ADP-ribosyl cyclase 1	3	LVTQTIPCNK	Carbamidomethyl(8)Deamidated(9)	2.63	2	587.8
34996495	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit 2	1	SNLDPSNVDSLFFYAAQSSQVLSGC EISVSNETK	Carbamidomethyl(24)Deamidated(30)	5.05	3	1183.2
46849812	Fibronectin	10	ESNPLTAQQTTKLDAPTNLQFVNET DR	Carbamyl(12)Deamidated(23)	7.45	3	1011.8
165905611	latent transforming growth factor beta binding protein 4	2	NATSVDSGAPGGAAPGGPGFR	Deamidated(1)	5.14	2	922.4
46309573	Protein sel-1 homolog 1	3	GQTGLGFLYASGLGVNSSQAK	Deamidated(16)	3.61	3	686.0
124494256	Pro-low-density lipoprotein receptor-related protein 1	22	FNSTEYQVVTR	Deamidated(2)	3.19	2	672.8
568990926	Anoctamin-6	2	NTDKENPYIGLGNITLCR	Carbamidomethyl(17)Deamidated(13)	4.66	3	710.3
594140550	Collagen type XII alpha-1	3	MLEAYNLTEK	Deamidated(6)Oxidation(1)	3.12	2	614.8
47523368	Prolyl 3-hydroxylase 3	2	DALLMEGVTLTQDAQQLNGSER	Deamidated(18)Oxidation(5)	6.01	3	802.7
20137008	Biglycan	2	MIENGSLSFLPTLR	Deamidated(4)Oxidation(1)	3.35	2	797.4
13384648	Biotinidase	1	FNDTEVLQR	Deamidated(2)	2.44	2	561.8
568960005	Choline transporter-like protein 2	3	KNITDLVEGAK	Deamidated(2)	3.57	2	594.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1131.6	34.0	14	1.23E+05	1.71E+05	1.58E+05	7.03E+04	2.08E+05	1.99E+05	8.99E+04	1.47E+05	7.37E+04	7.74E+04	7.60E+04
1665.8	20.6	1	1.75E+06	1.01E+06	3.78E+06	0.00E+00	4.47E+06	4.18E+06	1.73E+06	2.11E+06	5.31E+05	5.27E+05	9.20E+05
1094.5	31.1	4	2.65E+05	2.81E+05	3.85E+05	1.76E+05	3.49E+05	3.81E+05	1.68E+05	2.81E+05	1.07E+05	8.15E+04	1.97E+05
1713.8	38.5	16	2.48E+05	2.67E+05	3.91E+05	6.74E+04	3.57E+05	3.45E+05	2.18E+05	1.61E+05	8.05E+04	7.62E+04	1.63E+05
1636.8	39.0	14	1.67E+05	1.80E+05	2.08E+05	1.08E+05	2.40E+05	2.15E+05	8.56E+04	1.60E+05	7.76E+04	5.60E+04	1.08E+05
2100.9	27.6	12	6.50E+04	7.68E+04	1.02E+05	3.81E+04	1.86E+05	1.55E+05	7.46E+04	1.05E+05	4.28E+04	3.32E+04	8.83E+04
2302.0	42.4	14	2.24E+05	1.42E+05	2.18E+05	8.07E+04	1.38E+05	1.37E+05	4.83E+04	1.13E+05	3.71E+04	4.60E+04	1.36E+05
1413.7	29.9	19	1.20E+06	1.45E+06	1.71E+06	5.95E+05	1.45E+06	1.46E+06	1.09E+06	8.09E+05	4.98E+05	2.67E+05	9.09E+05
1275.7	45.3	30	1.53E+06	2.29E+06	2.43E+06	1.09E+06	2.33E+06	2.31E+06	1.36E+06	1.46E+06	1.36E+06	5.47E+05	1.12E+06
2396.2	39.6	46	2.80E+05	2.36E+05	5.18E+05	1.47E+05	4.17E+05	3.52E+05	1.36E+05	2.55E+05	1.23E+05	1.09E+05	1.80E+05
1733.8	41.2	544	5.49E+06	7.68E+06	8.90E+06	5.32E+06	1.10E+07	9.43E+06	3.36E+06	5.38E+06	2.77E+06	3.65E+06	4.31E+06
2469.3	38.2	10	1.17E+05	1.44E+05	2.97E+05	1.48E+05	3.63E+05	3.79E+05	1.63E+04	1.93E+05	1.03E+05	8.07E+04	9.82E+04
2195.0	43.3	72	3.39E+06	5.65E+06	4.24E+06	2.35E+06	4.00E+06	3.61E+06	1.76E+06	2.26E+06	1.65E+06	4.35E+05	1.57E+06
1582.7	36.3	21	2.47E+05	3.40E+05	3.86E+05	1.81E+05	3.98E+05	4.14E+05	1.55E+05	1.91E+05	1.14E+05	1.09E+05	1.93E+05
1174.6	27.1	10	4.72E+05	3.28E+05	5.70E+05	2.39E+03	6.85E+05	5.68E+05	3.57E+05	2.94E+05	1.91E+05	1.21E+05	2.89E+05
3547.6	60.7	49	9.69E+05	1.37E+06	1.81E+06	6.42E+05	1.66E+06	1.45E+06	1.62E+05	1.09E+06	4.88E+05	3.05E+05	1.01E+06
3033.5	44.3	31	2.62E+05	3.90E+05	3.58E+05	3.63E+05	5.42E+05	3.99E+05	7.76E+04	3.12E+05	1.84E+05	1.45E+05	1.72E+05
1843.9	32.8	20	2.85E+06	3.60E+06	5.59E+06	2.97E+06	7.44E+06	6.87E+06	2.35E+06	4.47E+06	1.71E+06	2.09E+06	2.97E+06
2056.0	51.5	4	8.82E+04	1.12E+05	1.42E+05	5.72E+04	1.75E+05	1.51E+05	5.41E+04	1.20E+05	3.62E+04	3.04E+04	9.69E+04
1344.6	33.2	22	1.73E+06	1.91E+06	2.31E+06	1.08E+06	2.53E+06	2.43E+06	1.52E+06	1.43E+06	1.11E+06	6.07E+05	1.32E+06
2129.0	41.0	12	1.69E+05	2.01E+05	2.99E+05	1.18E+05	3.18E+05	2.96E+05	1.40E+05	1.86E+05	1.01E+05	6.41E+04	1.52E+05
1228.6	33.2	33	4.39E+06	5.38E+06	8.42E+06	4.44E+06	1.12E+07	1.02E+07	3.65E+06	6.70E+06	2.66E+06	3.31E+06	4.43E+06
2406.1	54.1	59	1.11E+06	1.87E+06	2.25E+06	9.83E+05	2.21E+06	2.22E+06	5.15E+05	1.85E+06	7.70E+05	3.62E+05	1.07E+06
1593.8	51.9	246	1.97E+07	3.21E+07	5.51E+07	2.74E+07	6.30E+07	5.73E+07	1.72E+07	4.03E+07	2.28E+07	1.51E+07	2.72E+07
1122.5	31.2	1	3.99E+05	6.46E+05	8.71E+05	3.79E+05	7.46E+05	6.73E+05	2.98E+05	4.74E+05	1.90E+05	2.01E+05	3.12E+05
1188.6	32.1	11	1.10E+06	1.62E+06	1.92E+06	6.61E+05	2.10E+06	1.76E+06	1.20E+06	1.35E+06	7.17E+05	5.13E+05	1.03E+06

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
6.29E+04	6.15E+04	9.31E+04	8.96E+04	1.18E+05	1.07E+05	0.62	3.80E-01	1.83E-02	0.80	3.85E-01	1.20E-01	7.95E+04	6.38E+04
9.16E+05	1.48E+06	9.29E+05	1.54E+06	1.65E+06	2.55E+06	0.61	7.43E-01	1.71E-01	0.80	8.01E-01	4.17E-01	1.18E+06	9.52E+05
9.33E+04	1.70E+05	1.16E+05	1.73E+05	2.35E+05	2.79E+05	0.63	4.94E-01	3.11E-02	0.80	4.80E-01	1.55E-01	1.51E+05	1.22E+05
9.01E+04	1.63E+05	1.12E+05	1.75E+05	1.80E+05	1.98E+05	0.61	4.94E-01	5.23E-02	0.80	4.78E-01	1.91E-01	1.32E+05	1.06E+05
6.28E+04	1.05E+05	8.19E+04	1.30E+05	1.37E+05	1.18E+05	0.62	4.15E-01	1.84E-02	0.80	3.77E-01	9.16E-02	9.15E+04	7.32E+04
3.38E+04	6.04E+04	5.21E+04	5.02E+04	7.61E+04	6.58E+04	0.61	5.29E-01	6.74E-02	0.80	5.39E-01	2.23E-01	5.30E+04	4.24E+04
2.97E+04	9.29E+04	4.97E+04	7.28E+04	8.00E+04	1.20E+05	0.62	6.16E-01	8.35E-02	0.80	7.13E-01	3.28E-01	7.16E+04	5.73E+04
4.18E+05	6.31E+05	6.56E+05	8.61E+05	8.37E+05	1.12E+06	0.62	4.76E-01	2.65E-02	0.80	4.59E-01	1.31E-01	6.47E+05	5.17E+05
1.12E+06	1.02E+06	8.41E+05	1.61E+06	1.50E+06	1.36E+06	0.64	3.83E-01	8.92E-03	0.80	3.93E-01	9.10E-02	1.05E+06	8.38E+05
1.15E+05	1.52E+05	1.42E+05	2.41E+05	2.32E+05	1.69E+05	0.61	4.81E-01	5.18E-02	0.80	4.50E-01	1.79E-01	1.55E+05	1.23E+05
5.12E+06	4.12E+06	2.57E+06	3.12E+06	3.30E+06	4.61E+06	0.58	3.77E-01	2.00E-02	0.80	4.82E-01	1.47E-01	3.70E+06	2.95E+06
1.16E+05	1.16E+05	3.48E+04	1.64E+05	2.49E+05	1.00E+05	0.61	7.15E-01	1.34E-01	0.80	7.54E-01	3.52E-01	1.10E+05	8.76E+04
1.19E+06	2.35E+06	1.73E+06	3.18E+06	3.08E+06	2.89E+06	0.64	5.70E-01	5.75E-02	0.80	6.27E-01	2.56E-01	1.85E+06	1.47E+06
8.68E+04	1.98E+05	1.03E+05	1.79E+05	1.93E+05	2.55E+05	0.61	4.79E-01	3.37E-02	0.80	4.69E-01	1.43E-01	1.52E+05	1.21E+05
1.74E+05	2.06E+05	2.15E+05	2.96E+05	2.83E+05	2.99E+05	0.61	5.10E-01	7.34E-02	0.80	4.72E-01	2.03E-01	2.17E+05	1.73E+05
4.99E+05	6.42E+05	4.90E+05	7.42E+05	8.12E+05	8.12E+05	0.62	5.32E-01	6.92E-02	0.80	5.62E-01	2.46E-01	6.12E+05	4.86E+05
2.89E+05	2.39E+05	1.18E+05	2.30E+05	2.01E+05	1.29E+05	0.59	4.36E-01	2.29E-02	0.80	5.79E-01	2.12E-01	1.84E+05	1.46E+05
1.64E+06	3.17E+06	1.48E+06	2.21E+06	3.39E+06	3.30E+06	0.60	4.73E-01	4.34E-02	0.79	4.88E-01	1.73E-01	2.36E+06	1.88E+06
5.66E+04	6.12E+04	4.67E+04	7.83E+04	7.02E+04	6.51E+04	0.61	4.74E-01	4.03E-02	0.79	5.18E-01	1.96E-01	5.88E+04	4.67E+04
8.47E+05	1.19E+06	7.82E+05	1.49E+06	1.25E+06	1.37E+06	0.62	3.70E-01	7.62E-03	0.79	3.22E-01	3.73E-02	1.03E+06	8.15E+05
8.60E+04	1.34E+05	9.94E+04	1.42E+05	1.70E+05	1.50E+05	0.61	4.31E-01	2.49E-02	0.79	3.86E-01	9.02E-02	1.15E+05	9.15E+04
2.45E+06	4.84E+06	2.13E+06	3.23E+06	5.17E+06	4.92E+06	0.60	4.71E-01	4.04E-02	0.79	4.92E-01	1.67E-01	3.57E+06	2.83E+06
6.19E+05	1.13E+06	6.86E+05	1.40E+06	1.31E+06	1.14E+06	0.63	5.21E-01	5.11E-02	0.79	5.58E-01	2.19E-01	8.84E+05	7.01E+05
1.48E+07	2.16E+07	1.60E+07	3.34E+07	3.00E+07	2.64E+07	0.62	4.85E-01	4.80E-02	0.79	4.59E-01	1.66E-01	2.13E+07	1.69E+07
3.38E+05	3.91E+05	1.92E+05	3.52E+05	3.36E+05	3.53E+05	0.60	4.00E-01	2.51E-02	0.79	4.67E-01	1.51E-01	2.93E+05	2.32E+05
6.59E+05	8.50E+05	5.91E+05	1.13E+06	1.13E+06	9.13E+05	0.62	4.02E-01	1.67E-02	0.79	3.70E-01	8.18E-02	7.92E+05	6.27E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
224967112	coagulation factor XIII B chain	2	EQETCLAPELEHGNYSTTQR	Carbamidomethyl(5)Deamidated(14)	4.27	3	788.7
153791389	integrin alpha-1	13	ENMTFGSTLVNPK	Deamidated(2)Oxidation(3)	3.72	2	778.4
170172560	Heparan sulfate 2-O-sulfotransferase 1	1	YHVLHINTTK	Deamidated(7)	2.59	2	613.8
153791270	Laminin subunit gamma-1	12	CDQCEENYFYNR	Carbamidomethyl(1)Carbamidomethyl(4)Deamidated(11)	4.36	2	849.8
133778978	Cation-independent mannose-6-phosphate receptor	12	MSVINFECK	Carbamidomethyl(8)Deamidated(9)Oxidation(1)	3.24	2	629.8
568958751	Hypoxia up-regulated protein	7	LSALDNLLNHSSIFLK	Deamidated(9)	7.1	3	596.0
568954529	Protocadherin Fat 1	6	TGTIAIQNTQLR	Deamidated(8)	3.58	2	709.4
755532856	Laminin, alpha 2	17	VFQAESHAQQLNDSSAVLDGILDEAKNISFNATAAFR	Deamidated(12)Deamidated(27)Deamidated(31)	8.49	4	981.7
568971835	Integrin beta-3	1	DLPEELSLSFNATCLNNEVIPGLK	Carbamidomethyl(14)Deamidated(11)	3.6	3	892.1
568990926	Anoctamin-6	2	LNITCESSK	Carbamidomethyl(5)Deamidated(2)	2.52	2	526.8
6755863	Endoplasmic reticulum chaperone protein	3	GVVDSDDLPLNVSR	Deamidated(11)	3.46	2	743.9
594140550	Collagen type XII alpha-1	3	NLQVYNATSNSTLVK	Deamidated(6)	4.68	2	826.9
755503302	Chloride channel calcium activated 1	1	MSQHPLDLQEDFNATLVNASSLIPK	Deamidated(14)Deamidated(19)Oxidation(1)	5.75	3	967.5
6680878	Lysosome membrane protein 2	7	NMVLQNGTK	Deamidated(1)Deamidated(6)Oxidation(2)	2.72	2	511.3
33859596	Prolyl 4-hydroxylase subunit alpha-1	1	DMSDGFISNLTQIR	Deamidated(9)Oxidation(2)	4.27	2	807.4
755551258	CMP-N-acetylneuraminase-beta-galactosidase-2,3-sialyltransferase 1	1	TGVHDGDFEYNITTTLAANK	Deamidated(11)	5.54	3	761.0
568972124	Prolyl 4-hydroxylase subunit alpha-2	1	SLSNQTDAGLATQENLYERPTDYLPER	Deamidated(4)	5.32	3	1028.2
568909251	GPI ethanolamine phosphate transferase 1	1	ENPVEFDSLFINESK	Deamidated(11)	3.75	2	828.4
6754148	H-2 class I histocompatibility antigen, D-37 alpha chain	1	LGNETLQR	Deamidated(3)	2.47	2	466.2
46309573	Protein sel-1 homolog 1	3	EATIVGENETYPR	Deamidated(8)	2.67	2	740.4
755470160	Complement C4-B	2	NTTCQDLQIEVK	Carbamidomethyl(4)Deamidated(1)	3.33	2	725.3
568984304	Lipid phosphate phosphohydrolase 1	1	INCSDGYIEDYICQGNEEK	Carbamidomethyl(3)Carbamidomethyl(13)Deamidated(2)	4.23	2	1154.5
568987063	stabilin-1	7	AYTIFVPTNHSLETQGNNSVLGIDTVR	Deamidated(17)Deamidated(18)	6.48	3	983.5
224994201	Inactive serine protease PAMR1	1	SPGFKNDTLHYGMVR	Deamidated(6)Oxidation(13)	3.31	3	580.3

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2364.0	32.7	9	5.69E+04	1.22E+05	1.55E+05	7.15E+04	2.34E+05	1.70E+05	8.31E+04	7.12E+04	4.90E+04	4.53E+04	9.98E+04
1555.7	35.9	18	1.97E+05	3.02E+05	3.43E+05	1.26E+05	4.16E+05	4.03E+05	2.26E+05	2.71E+05	1.24E+05	9.09E+04	1.95E+05
1226.7	24.9	15	8.42E+05	6.74E+05	8.83E+05	0.00E+00	9.58E+05	7.72E+05	5.04E+05	6.34E+05	2.62E+05	2.18E+05	3.90E+05
1698.6	32.9	18	2.74E+05	1.90E+05	4.78E+05	1.15E+05	5.78E+05	6.17E+05	2.86E+05	1.66E+05	1.41E+05	1.39E+05	2.10E+05
1258.5	33.7	13	1.18E+05	1.59E+05	1.97E+05	3.83E+04	2.08E+05	2.30E+05	9.05E+04	8.82E+04	5.84E+04	4.25E+04	7.97E+04
1786.0	57.9	28	1.07E+06	2.53E+06	2.08E+06	1.39E+06	2.54E+06	2.24E+06	5.96E+05	1.91E+06	1.09E+06	3.42E+05	1.44E+06
1417.8	34.6	17	2.03E+05	2.92E+05	3.25E+05	1.27E+05	3.65E+05	3.39E+05	1.35E+05	2.36E+05	9.37E+04	6.94E+04	1.69E+05
3923.9	70.6	46	2.38E+05	4.72E+05	1.53E+06	2.02E+05	9.25E+05	4.85E+05	9.83E+03	4.58E+05	4.93E+04	2.17E+04	1.05E+05
2674.3	68.9	11	6.84E+04	2.13E+05	2.63E+05	7.91E+04	2.27E+05	1.85E+05	2.64E+04	1.33E+05	6.88E+04	2.59E+04	1.16E+05
1052.5	24.7	4	1.15E+05	1.36E+05	1.56E+05	5.02E+03	1.96E+05	2.09E+05	1.27E+05	1.03E+05	4.70E+04	3.65E+04	9.19E+04
1486.7	42.9	3	9.22E+04	1.30E+05	1.37E+05	6.48E+04	1.48E+05	1.55E+05	7.86E+04	8.46E+04	5.48E+04	2.19E+04	6.24E+04
1652.8	38.0	122	1.71E+06	2.08E+06	2.85E+06	2.04E+06	4.05E+06	3.59E+06	6.48E+05	2.69E+06	1.06E+06	1.21E+06	1.91E+06
2900.4	56.9	7	4.15E+04	8.60E+04	1.27E+05	2.71E+04	1.64E+05	1.24E+05	3.48E+04	9.63E+04	5.37E+04	6.53E+03	6.07E+04
1021.5	19.8	26	3.37E+05	2.52E+05	3.67E+05	0.00E+00	4.95E+05	6.30E+05	2.90E+05	3.30E+05	1.08E+05	9.08E+04	2.03E+05
1613.7	50.9	79	2.46E+06	4.31E+06	5.43E+06	2.75E+06	6.49E+06	5.55E+06	2.46E+06	3.31E+06	2.25E+06	8.88E+05	2.78E+06
2281.1	54.3	15	1.15E+05	1.86E+05	1.83E+05	1.08E+05	1.91E+05	2.35E+05	4.94E+04	1.76E+05	7.40E+04	4.93E+04	1.71E+05
3082.5	44.2	16	7.54E+05	1.31E+06	1.22E+06	1.03E+06	1.17E+06	1.17E+06	4.55E+05	9.00E+05	8.26E+05	2.93E+05	5.38E+05
1655.7	51.2	9	1.90E+05	1.60E+05	2.21E+05	1.08E+05	2.90E+05	2.34E+05	1.08E+05	1.67E+05	7.58E+04	6.81E+04	1.09E+05
931.5	21.4	3	1.47E+05	9.98E+04	1.34E+05	3.37E+05	2.18E+05	1.94E+05	3.63E+04	1.41E+05	3.93E+04	4.62E+04	9.89E+04
1479.7	31.2	7	1.56E+06	2.93E+06	2.95E+06	3.36E+06	2.85E+06	2.56E+06	1.55E+06	2.11E+06	1.22E+06	1.02E+06	1.51E+06
1449.7	34.8	3	3.02E+05	2.61E+05	4.63E+05	9.25E+05	4.03E+05	4.47E+05	1.86E+05	2.16E+05	1.18E+05	1.58E+05	2.09E+05
2307.9	44.1	3	2.73E+04	3.08E+04	7.29E+04	9.32E+03	7.50E+04	8.47E+04	6.12E+04	2.72E+04	2.20E+04	8.07E+03	3.28E+04
2948.5	51.8	16	2.22E+05	3.13E+05	4.52E+05	2.34E+05	6.31E+05	6.55E+05	1.29E+05	4.70E+05	1.73E+05	1.45E+05	2.34E+05
1738.8	26.6	3	7.18E+04	7.60E+04	9.85E+04	8.81E+04	1.35E+05	1.40E+05	7.29E+04	7.13E+04	4.11E+04	2.75E+04	5.25E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
5.18E+04	6.32E+04	5.33E+04	6.12E+04	7.75E+04	7.79E+04	0.59	4.86E-01	6.11E-02	0.79	4.72E-01	1.77E-01	6.21E+04	4.92E+04
1.10E+05	1.75E+05	1.56E+05	1.72E+05	2.25E+05	1.85E+05	0.61	4.14E-01	2.37E-02	0.79	3.92E-01	1.05E-01	1.52E+05	1.21E+05
2.90E+05	3.95E+05	3.36E+05	4.78E+05	4.65E+05	4.38E+05	0.61	4.59E-01	5.58E-02	0.79	4.50E-01	1.99E-01	3.52E+05	2.78E+05
1.34E+05	1.92E+05	1.39E+05	2.87E+05	2.00E+05	1.72E+05	0.58	5.17E-01	7.83E-02	0.79	5.22E-01	2.27E-01	1.73E+05	1.37E+05
5.41E+04	8.69E+04	5.48E+04	1.19E+05	1.29E+05	7.44E+04	0.61	5.53E-01	6.65E-02	0.79	5.42E-01	2.05E-01	7.40E+04	5.85E+04
6.73E+05	1.04E+06	8.34E+05	1.53E+06	1.33E+06	1.57E+06	0.64	5.24E-01	4.65E-02	0.79	5.61E-01	2.07E-01	1.00E+06	7.91E+05
1.14E+05	1.42E+05	1.11E+05	1.96E+05	1.49E+05	1.98E+05	0.61	4.51E-01	3.08E-02	0.79	4.46E-01	1.38E-01	1.33E+05	1.05E+05
9.03E+04	7.57E+04	4.16E+05	7.32E+05	5.62E+05	3.87E+05	0.62	1.15E+00	3.32E-01	0.79	1.38E+00	5.91E-01	2.63E+05	2.08E+05
9.08E+04	5.80E+04	6.09E+04	1.14E+05	1.06E+05	1.24E+05	0.62	6.21E-01	1.10E-01	0.79	6.84E-01	3.14E-01	8.03E+04	6.33E+04
4.84E+04	7.46E+04	6.02E+04	8.46E+04	8.36E+04	1.09E+05	0.61	5.22E-01	6.62E-02	0.79	5.08E-01	1.99E-01	6.84E+04	5.39E+04
3.94E+04	5.47E+04	6.96E+04	1.01E+05	8.30E+04	8.78E+04	0.62	4.73E-01	2.26E-02	0.79	4.53E-01	1.05E-01	5.99E+04	4.71E+04
1.05E+06	1.57E+06	6.70E+05	1.15E+06	1.73E+06	1.74E+06	0.60	4.75E-01	4.26E-02	0.79	5.20E-01	1.84E-01	1.31E+06	1.03E+06
2.95E+04	2.71E+04	5.65E+04	1.04E+05	6.35E+04	7.88E+04	0.64	7.37E-01	1.39E-01	0.78	7.83E-01	3.33E-01	4.83E+04	3.79E+04
1.21E+05	1.78E+05	1.68E+05	3.16E+05	2.10E+05	2.15E+05	0.60	5.80E-01	9.29E-02	0.78	6.00E-01	2.62E-01	1.75E+05	1.37E+05
1.66E+06	2.23E+06	2.10E+06	3.11E+06	2.96E+06	3.33E+06	0.61	4.64E-01	2.86E-02	0.78	4.25E-01	9.42E-02	2.21E+06	1.73E+06
7.63E+04	5.82E+04	6.35E+04	8.57E+04	1.23E+05	9.47E+04	0.62	5.36E-01	4.23E-02	0.78	6.09E-01	2.19E-01	8.48E+04	6.63E+04
4.55E+05	6.02E+05	5.34E+05	6.85E+05	9.91E+05	8.91E+05	0.64	4.09E-01	1.02E-02	0.78	4.32E-01	1.03E-01	5.81E+05	4.54E+05
1.05E+05	7.57E+04	9.21E+04	1.26E+05	1.43E+05	1.00E+05	0.59	3.80E-01	1.67E-02	0.78	3.54E-01	6.33E-02	9.77E+04	7.62E+04
5.99E+04	8.43E+04	8.96E+04	1.19E+05	9.39E+04	1.03E+05	0.58	5.19E-01	8.27E-02	0.78	5.48E-01	2.54E-01	8.22E+04	6.41E+04
1.93E+06	1.34E+06	8.97E+05	1.62E+06	1.37E+06	1.32E+06	0.59	3.29E-01	5.08E-03	0.78	4.27E-01	7.92E-02	1.34E+06	1.04E+06
3.73E+05	1.58E+05	1.55E+05	2.81E+05	1.27E+05	1.60E+05	0.55	5.84E-01	7.91E-02	0.78	8.03E-01	3.38E-01	2.02E+05	1.57E+05
1.03E+04	3.56E+04	1.79E+04	2.23E+04	4.90E+04	4.40E+04	0.60	7.01E-01	1.15E-01	0.78	7.32E-01	2.92E-01	2.53E+04	1.96E+04
2.20E+05	1.36E+05	1.79E+05	3.17E+05	2.89E+05	2.22E+05	0.60	4.97E-01	6.01E-02	0.78	5.29E-01	2.10E-01	2.08E+05	1.61E+05
4.70E+04	4.24E+04	5.56E+04	6.76E+04	6.08E+04	6.11E+04	0.59	3.56E-01	9.28E-03	0.78	2.87E-01	1.61E-02	4.95E+04	3.84E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
6671712	Leukocyte surface antigen CD53	1	LNTLVAEGLNDSIQHYHSDNSTMK	Deamidated(2)Deamidated(20)Oxidation(23)	4.39	4	676.8
529250188	Angiotensin-converting	3	STEVSNHTLK	Deamidated(6)	3.03	2	558.8
158711710	Chondroitin sulfate glucuronyltransferase	1	ATLSTLAVAVNR	Deamidated(11)	2.62	2	608.8
31981983	Stromal interaction molecule	1	LAVTNTTMTGTVLK	Deamidated(5)Oxidation(8)	3.73	2	733.9
164565411	Collagen alpha-1(V)	3	VYCNFTAGGSTCVFPDKK	Carbamidomethyl(3)Carbamidomethyl(12)Deamidated(4)	2.96	2	1026.5
568933707	ADP-ribosyl cyclase 2	1	DSSGVINVMLNGSEPK	Deamidated(11)Oxidation(9)	4.13	2	832.4
568915220	CD44 antigen	1	TEAADLCQAFNSTLPTMDQMK	Carbamidomethyl(7)Deamidated(11)Oxidation(17)Oxidation(20)	5.23	3	802.3
165932373	Collectin-12	4	ETLQNNFLITTVNK	Deamidated(5)Deamidated(14)	3.26	2	862.9
6753332	Monocyte differentiation antigen CD14	3	VLSIAQAHSLNFSCEQVR	Carbamidomethyl(14)Deamidated(11)	4.47	3	687.3
568941620	Glucoside xylosyltransferase	2	QFNSTQLAAMAPEHEIPK	Deamidated(3)Oxidation(10)	4.6	3	677.0
568962759	Dystroglycan	1	LAFAFGDRNCSSITLQNITR	Carbamidomethyl(10)Deamidated(9)Deamidated(17)	4.28	3	762.7
568995622	Target of Nesh-SH3	2	VHINTTSDSILLK	Deamidated(4)	2.64	2	721.4
529250188	Angiotensin-converting	3	QQYNSLLSNMSR	Deamidated(9)Oxidation(10)	3.32	2	729.3
6681143	Decorin	3	LGLSFNSITVMENGLANVPHLR	Deamidated(13)Deamidated(18)Oxidation(11)	3.72	3	829.1
568991244	Collagen alpha-1(XIV) chain	4	AINASANITSDGVEVLGR	Deamidated(3)Deamidated(7)	4.26	2	894.5
755496541	Complement component receptor 1-like protein	1	INYTCNQGYR	Carbamidomethyl(5)Deamidated(2)	2.88	2	645.3
568958972	Neural cell adhesion molecule 1	2	DGQLLPSSNYSNIK	Deamidated(9)	3.62	2	768.9
568915917	Tyrosine-protein phosphatase non-receptor type substrate 1	5	NTDGTYNYTSLFLVNSSAHR	Deamidated(15)	6.28	3	754.4
569006247	Atlastin-3	1	ELGGAIDSGAAYVLEQASSHIGNSTQA AVR	Deamidated(23)	7.64	3	991.8
568915307	Dipeptidyl peptidase 4	1	KLDFIVLNETR	Deamidated(8)	2.81	2	674.9
6680878	Lysosome membrane protein	7	NGTNDGEYVFLTGEDNYLNFSK	Deamidated(1)Deamidated(19)	5.79	3	833.7

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2704.3	36.7	8	1.85E+05	1.40E+05	7.14E+05	9.16E+04	1.02E+06	8.58E+05	1.05E+05	4.05E+05	1.62E+05	1.06E+05	3.67E+05
1116.6	17.3	5	2.36E+05	1.37E+05	3.32E+05	6.94E+02	3.71E+05	1.12E+02	3.08E+05	1.76E+05	9.23E+04	5.35E+04	1.26E+05
1216.7	40.2	1	1.05E+05	1.38E+05	1.82E+05	5.99E+04	1.54E+05	1.37E+05	6.16E+04	1.14E+05	4.36E+04	3.49E+04	6.72E+04
1466.8	34.1	18	1.17E+06	1.03E+06	1.35E+06	5.55E+05	1.82E+06	1.64E+06	7.42E+05	1.19E+06	5.08E+05	4.34E+05	7.76E+05
2051.9	35.8	10	1.77E+05	1.36E+05	2.41E+05	6.98E+04	5.08E+05	4.15E+05	1.18E+05	1.44E+05	4.70E+04	8.09E+04	1.50E+05
1663.8	39.8	17	4.12E+05	4.51E+05	4.45E+05	2.69E+05	4.18E+05	4.16E+05	2.31E+05	3.23E+05	2.04E+05	1.13E+05	2.55E+05
2405.0	46.2	36	7.79E+05	1.01E+06	1.07E+06	5.69E+05	1.14E+06	1.00E+06	6.45E+05	6.00E+05	4.58E+05	1.87E+05	5.93E+05
1724.9	47.3	8	2.53E+05	2.91E+05	3.24E+05	1.12E+05	4.34E+05	4.38E+05	2.07E+05	3.27E+05	1.30E+05	8.11E+04	2.08E+05
2060.0	39.9	11	2.02E+05	2.49E+05	3.59E+05	1.41E+05	2.67E+05	2.41E+05	1.16E+05	1.65E+05	1.46E+05	6.60E+04	1.41E+05
2029.0	34.4	18	3.98E+05	3.22E+05	4.84E+05	2.77E+05	5.47E+05	4.67E+05	2.22E+05	3.41E+05	1.56E+05	1.18E+05	2.51E+05
2286.1	50.1	11	1.67E+05	1.49E+05	3.94E+05	4.42E+04	5.16E+05	4.90E+05	2.54E+04	1.98E+05	5.27E+04	1.04E+04	3.07E+05
1441.8	36.7	16	1.30E+05	1.08E+05	2.48E+05	1.46E+05	3.53E+05	2.88E+05	9.20E+04	1.85E+05	6.89E+04	8.59E+04	1.79E+05
1457.7	31.3	14	1.99E+05	1.24E+05	2.07E+05	1.13E+05	2.76E+05	2.68E+05	1.65E+05	1.22E+05	1.25E+05	5.35E+04	1.29E+05
2485.3	50.7	191	1.80E+06	1.97E+06	6.63E+06	2.06E+06	4.76E+06	4.90E+06	5.91E+05	5.05E+06	9.63E+05	6.00E+05	3.82E+06
1787.9	43.8	127	2.68E+06	3.13E+06	6.29E+06	2.13E+06	9.08E+06	9.11E+06	1.36E+06	6.97E+06	1.92E+06	1.05E+06	4.34E+06
1289.6	24.7	15	2.18E+05	1.75E+05	2.49E+05	7.10E+03	3.38E+05	3.27E+05	2.31E+05	1.24E+05	9.74E+04	5.87E+04	1.29E+05
1536.8	39.2	25	1.01E+06	1.74E+06	2.39E+06	9.07E+05	1.85E+06	1.68E+06	1.31E+06	1.54E+06	7.98E+05	4.72E+05	8.65E+05
2261.0	48.0	41	2.15E+06	4.98E+06	3.52E+06	2.55E+06	4.59E+06	3.65E+06	2.56E+06	2.41E+06	2.24E+06	1.25E+06	2.01E+06
2973.5	55.4	23	1.97E+05	4.61E+05	6.32E+05	1.72E+05	3.90E+05	4.08E+05	6.81E+04	2.08E+05	1.89E+05	7.35E+04	3.07E+05
1348.7	43.1	7	5.50E+04	5.91E+04	8.84E+04	2.39E+04	9.03E+04	7.23E+04	4.75E+04	6.41E+04	1.76E+04	7.78E+03	5.04E+04
2499.1	61.4	64	2.30E+05	2.58E+05	4.09E+05	8.71E+04	4.79E+05	4.16E+05	7.56E+04	2.84E+05	1.04E+05	8.43E+04	1.97E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.64E+05	1.96E+05	1.98E+05	2.15E+05	3.21E+05	3.29E+05	0.58	7.36E-01	2.01E-01	0.77	7.97E-01	4.05E-01	2.23E+05	1.73E+05
9.39E+04	1.16E+05	1.10E+05	1.32E+05	1.48E+05	9.51E+04	0.59	6.06E-01	1.50E-01	0.77	6.48E-01	3.26E-01	1.05E+05	8.11E+04
7.16E+04	6.40E+04	3.80E+04	1.01E+05	7.63E+04	7.28E+04	0.60	4.48E-01	2.60E-02	0.77	4.95E-01	1.39E-01	6.30E+04	4.87E+04
5.48E+05	5.84E+05	5.34E+05	8.59E+05	8.27E+05	7.19E+05	0.59	3.84E-01	1.89E-02	0.77	3.39E-01	7.13E-02	6.33E+05	4.89E+05
9.06E+04	1.38E+05	8.25E+04	8.82E+04	1.31E+05	1.53E+05	0.55	5.76E-01	1.21E-01	0.77	6.34E-01	3.03E-01	1.10E+05	8.52E+04
2.26E+05	1.47E+05	1.61E+05	3.00E+05	2.63E+05	2.45E+05	0.61	3.53E-01	3.60E-03	0.77	3.69E-01	4.47E-02	2.04E+05	1.58E+05
3.95E+05	4.70E+05	3.60E+05	5.46E+05	7.03E+05	6.58E+05	0.61	4.01E-01	8.13E-03	0.77	3.58E-01	3.58E-02	4.62E+05	3.56E+05
1.20E+05	1.37E+05	1.81E+05	2.35E+05	2.30E+05	1.53E+05	0.60	4.49E-01	2.58E-02	0.77	4.62E-01	1.18E-01	1.60E+05	1.24E+05
9.49E+04	1.21E+05	9.00E+04	1.72E+05	1.86E+05	1.53E+05	0.61	4.28E-01	1.74E-02	0.77	4.02E-01	7.83E-02	1.22E+05	9.35E+04
1.19E+05	2.25E+05	1.40E+05	2.48E+05	3.00E+05	3.06E+05	0.60	4.33E-01	1.41E-02	0.77	3.83E-01	4.85E-02	2.02E+05	1.55E+05
6.34E+04	1.09E+05	9.97E+04	1.19E+05	1.93E+05	1.46E+05	0.58	8.87E-01	2.09E-01	0.77	1.05E+00	4.46E-01	1.22E+05	9.37E+04
3.68E+04	1.12E+05	8.20E+04	9.77E+04	1.33E+05	1.02E+05	0.58	5.39E-01	5.43E-02	0.77	5.88E-01	1.86E-01	9.98E+04	7.66E+04
6.50E+04	1.08E+05	1.12E+05	1.46E+05	1.29E+05	1.02E+05	0.59	3.92E-01	1.08E-02	0.77	3.65E-01	3.93E-02	1.02E+05	7.78E+04
6.22E+05	1.58E+06	1.13E+06	2.33E+06	2.70E+06	2.86E+06	0.61	7.77E-01	1.59E-01	0.77	9.11E-01	3.90E-01	1.81E+06	1.39E+06
1.44E+06	2.76E+06	1.95E+06	3.18E+06	4.12E+06	4.04E+06	0.60	6.67E-01	1.26E-01	0.77	7.28E-01	3.12E-01	2.69E+06	2.06E+06
7.25E+04	1.24E+05	9.49E+04	1.59E+05	1.43E+05	1.37E+05	0.59	5.03E-01	5.83E-02	0.76	4.77E-01	1.45E-01	1.10E+05	8.42E+04
5.33E+05	7.30E+05	7.08E+05	1.23E+06	1.56E+06	1.08E+06	0.61	4.67E-01	1.88E-02	0.76	4.45E-01	8.36E-02	8.50E+05	6.49E+05
1.82E+06	1.54E+06	1.25E+06	2.41E+06	2.23E+06	2.80E+06	0.60	3.74E-01	8.03E-03	0.76	3.79E-01	6.37E-02	1.85E+06	1.41E+06
1.86E+05	1.51E+05	9.28E+04	1.77E+05	2.62E+05	1.98E+05	0.60	6.12E-01	9.05E-02	0.76	6.89E-01	2.62E-01	1.74E+05	1.32E+05
1.33E+04	2.56E+04	2.24E+04	5.70E+04	5.31E+04	5.06E+04	0.61	6.12E-01	5.79E-02	0.76	6.47E-01	2.00E-01	3.25E+04	2.47E+04
1.17E+05	1.14E+05	1.12E+05	2.51E+05	2.33E+05	1.13E+05	0.59	5.88E-01	7.81E-02	0.76	6.08E-01	2.14E-01	1.47E+05	1.12E+05

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	IRDQELEDNVHISPNGSIITIVGTRPS NHGAYR	Deamidated(15)	5.86	4	915.7
19527130	EMILIN-1	7	LEDRFNSTLGPSEEQEK	Deamidated(6)	3.32	3	660.3
22203747	Collagen alpha-2(VI) chain	6	RHAELSFVFLTDGVTGNDSLEESVH SMR	Deamidated(17)Oxidation(27)	8.76	4	788.4
124494256	Prolow-density lipoprotein receptor-related protein 1	22	IETILLNGTDRK	Deamidated(7)	3.87	3	458.6
7242187	Legumain	2	NGIPDEQIIVMMYDDIANSEENPTPG VVINRPNGTDVYK	Deamidated(1)Deamidated(30)Oxidation(11)Oxidation(12)	7.75	4	1088.8
569006515	Macrophage expressed gene 1	1	ALMDICDQLEKNQTK	Carbamidomethyl(6)Deamidated(12)Oxidation(3)	3.91	3	608.6
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	YHYNGSLMDGTLFDSSYSR	Deamidated(4)Oxidation(8)	5.33	3	744.0
568989825	Lysyl oxidase-like protein 2	3	HYHSMEVFTYYDLLSLNGTK	Deamidated(17)Oxidation(5)	6.22	3	812.4
226437629	Embigin	4	KDDEPLETTGDFNTTK	Deamidated(13)	5.55	2	906.4
22094083	CD48 antigen	4	ITLEVFDVPKPSIEINKTEASTDSCH LR	Carbamidomethyl(26)Deamidated(17)	4.83	4	825.2
31543672	Synaptonemal complex protein SC65	1	EEAMLYHNQTSELR	Deamidated(8)Oxidation(4)	4.1	3	579.9
86613790	Collagen alpha-2(V)	1	EASQNLTYICR	Carbamidomethyl(10)Deamidated(5)	3.61	2	678.3
46849812	Fibronectin	10	DQCIVDDITYNVNDTFHK	Carbamidomethyl(3)	3.91	3	733.3
160333204	Transmembrane protein 87A	1	LFQNCSELYK	Carbamidomethyl(5)Deamidated(4)	2.89	2	651.8
251823826	Sushi domain-containing protein 2	1	FCILDVMSTGSSSVGNATR	Carbamidomethyl(2)Deamidated(16)Oxidation(7)	4.45	3	673.6
110625851	Transmembrane protease serine 12	1	TREEGNGTTILQEAK	Deamidated(6)	2.98	2	824.4
78190502	Golgi membrane protein 1	1	AVLVNNITTGEK	Deamidated(5)Deamidated(6)	3.06	2	630.3
569001628	Inactive tyrosine-protein kinase 7	3	STNASFNIK	Deamidated(3)	3.02	2	491.7
189458849	Carboxypeptidase M	1	SVAQNYSSITHLSIGK	Deamidated(5)	3.95	3	615.0
158749638	Toll-like receptor 2	1	FLNLSSTGIR	Deamidated(3)	2.68	2	554.8
6678347	Thy-1 membrane glycoprotein	3	HENNTKDNSIQHEFSLTR	Deamidated(3)	6.58	3	724.3
21630263	Inhibitor of nuclear factor kappa-B kinase-interacting protein, isoform 2	2	ISNLTVVQAAIK	Deamidated(3)	3.76	2	629.4
170650603	EGF, latrophilin seven transmembrane domain-containing protein 1	2	DAHFNSTLTEFGETINNFVER	Deamidated(5)	6.53	3	814.7
239787900	Thrombospondin-2	1	VVNSTTGTGEHLR	Deamidated(3)	4.26	3	457.9

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
3659.8	38.4	18	7.81E+05	9.94E+05	1.59E+06	5.54E+05	1.57E+06	1.35E+06	1.10E+05	8.84E+05	4.06E+05	6.40E+05	6.33E+05
1978.9	29.9	80	1.02E+05	1.29E+05	1.80E+05	8.28E+04	2.63E+05	2.21E+05	8.75E+04	1.42E+05	4.38E+04	7.86E+04	1.09E+05
3150.5	46.2	47	6.54E+05	4.88E+05	2.78E+06	7.36E+05	1.85E+06	1.86E+06	1.32E+05	9.50E+05	2.96E+05	1.77E+05	4.84E+05
1373.8	32.9	3	3.00E+05	1.59E+05	2.55E+05	1.42E+05	3.42E+05	3.51E+05	1.47E+05	1.87E+05	1.12E+05	9.49E+04	9.82E+04
4352.0	59.3	112	4.19E+05	7.82E+05	9.06E+05	3.42E+05	6.14E+05	5.74E+05	1.84E+05	7.03E+05	5.20E+05	1.77E+05	4.37E+05
1823.9	33.4	2	1.98E+05	1.95E+05	3.69E+05	5.49E+04	3.56E+05	3.58E+05	1.66E+05	1.15E+05	6.98E+04	4.65E+04	1.14E+05
2229.9	40.8	63	2.82E+06	4.60E+06	3.72E+06	1.92E+06	2.99E+06	2.70E+06	1.68E+06	1.64E+06	1.33E+06	3.44E+05	1.07E+06
2435.1	48.8	17	7.61E+04	2.28E+05	2.52E+05	1.71E+05	2.48E+05	2.06E+05	4.88E+04	1.20E+05	7.21E+04	6.05E+04	1.10E+05
1811.8	30.1	28	3.22E+05	4.19E+05	3.33E+05	2.35E+05	4.11E+05	3.73E+05	3.13E+05	3.53E+05	3.14E+05	1.07E+05	1.65E+05
3297.7	44.3	2	1.00E+05	7.26E+04	1.50E+05	2.78E+04	1.19E+05	1.58E+05	2.61E+04	5.93E+04	2.07E+04	2.34E+04	5.20E+04
1737.8	26.4	28	9.51E+05	9.97E+05	1.12E+06	2.35E+04	1.45E+06	1.13E+06	6.70E+05	8.26E+05	3.40E+05	2.13E+05	4.66E+05
1355.6	32.4	18	4.64E+05	3.82E+05	6.79E+05	1.98E+05	1.05E+06	1.08E+06	4.24E+05	3.94E+05	1.49E+05	2.05E+05	3.24E+05
2198.0	44.5	589	6.95E+05	1.04E+06	1.38E+06	6.18E+05	1.52E+06	1.42E+06	3.56E+05	6.69E+05	4.04E+05	4.11E+05	5.97E+05
1302.6	35.2	5	2.84E+05	3.28E+05	4.42E+05	1.49E+05	4.55E+05	4.36E+05	2.27E+05	2.40E+05	1.45E+05	8.18E+04	1.81E+05
2018.9	45.3	12	1.21E+05	1.31E+05	1.57E+05	6.84E+04	2.28E+05	1.99E+05	9.53E+04	1.42E+05	6.48E+04	4.14E+04	1.65E+05
1647.8	36.8	3	5.93E+04	7.24E+04	1.19E+05	4.45E+04	1.46E+05	1.16E+05	4.22E+04	6.79E+04	3.43E+04	2.88E+04	5.22E+04
1259.7	33.5	31	7.68E+04	1.30E+05	2.27E+05	2.80E+04	1.64E+05	1.19E+05	1.07E+05	9.87E+04	6.84E+04	3.09E+04	6.78E+04
982.5	28.2	11	3.12E+05	3.71E+05	4.80E+05	6.06E+03	4.12E+05	3.29E+05	2.44E+05	2.81E+05	1.60E+05	7.35E+04	1.69E+05
1842.9	31.8	6	6.38E+04	5.69E+04	1.33E+05	3.77E+04	1.62E+05	1.18E+05	5.73E+04	5.36E+04	2.98E+04	2.76E+04	8.10E+04
1108.6	43.5	1	2.31E+05	2.69E+05	3.94E+05	1.22E+05	3.93E+05	3.39E+05	1.74E+05	2.28E+05	1.06E+05	8.44E+04	1.81E+05
2171.0	27.5	58	5.22E+05	2.26E+05	4.00E+05	2.17E+04	5.09E+05	4.31E+05	9.34E+04	1.84E+05	1.28E+05	1.28E+05	6.30E+04
1257.7	43.1	21	1.74E+06	2.08E+06	2.57E+06	1.05E+06	3.20E+06	2.74E+06	6.31E+05	2.05E+06	7.07E+05	7.17E+05	1.37E+06
2442.1	62.2	8	1.28E+05	2.67E+05	4.42E+05	1.03E+05	4.58E+05	4.38E+05	2.25E+04	2.37E+05	8.30E+04	4.68E+04	1.72E+05
1371.7	19.7	35	2.16E+06	2.27E+06	2.11E+06	1.49E+02	1.65E+06	1.46E+03	5.11E+05	1.41E+06	4.16E+05	2.96E+05	7.02E+05

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Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
4.09E+05	4.54E+05	3.48E+05	6.45E+05	6.63E+05	3.50E+05	0.57	4.73E-01	5.27E-02	0.76	5.75E-01	1.92E-01	5.17E+05	3.92E+05
6.32E+04	7.64E+04	6.32E+04	6.84E+04	9.60E+04	6.57E+04	0.56	4.05E-01	3.25E-02	0.76	4.63E-01	1.21E-01	7.73E+04	5.86E+04
3.92E+05	4.77E+05	5.22E+05	1.21E+06	1.03E+06	7.06E+05	0.58	7.88E-01	1.80E-01	0.76	8.80E-01	3.85E-01	5.89E+05	4.47E+05
1.06E+05	1.18E+05	1.05E+05	2.19E+05	1.32E+05	1.49E+05	0.58	4.26E-01	1.80E-02	0.76	4.06E-01	6.10E-02	1.25E+05	9.50E+04
3.22E+05	2.04E+05	2.78E+05	5.62E+05	5.04E+05	3.43E+05	0.63	4.98E-01	3.65E-02	0.76	5.85E-01	1.99E-01	3.41E+05	2.58E+05
9.39E+04	1.12E+05	1.03E+05	1.59E+05	1.74E+05	1.52E+05	0.57	5.36E-01	6.84E-02	0.76	5.29E-01	1.78E-01	1.15E+05	8.69E+04
8.60E+05	1.87E+06	1.40E+06	2.30E+06	2.44E+06	2.34E+06	0.61	5.52E-01	4.04E-02	0.76	6.13E-01	1.81E-01	1.49E+06	1.13E+06
1.17E+05	7.61E+04	5.38E+04	1.10E+05	1.03E+05	8.80E+04	0.57	4.42E-01	3.68E-02	0.76	5.31E-01	1.56E-01	8.90E+04	6.74E+04
1.87E+05	1.79E+05	1.63E+05	3.18E+05	2.96E+05	2.86E+05	0.62	3.27E-01	1.85E-03	0.76	4.10E-01	6.21E-02	2.05E+05	1.55E+05
1.71E+04	5.10E+04	4.38E+04	6.89E+04	5.60E+04	6.17E+04	0.57	5.94E-01	9.38E-02	0.76	6.46E-01	2.52E-01	4.48E+04	3.40E+04
3.00E+05	5.53E+05	4.04E+05	6.55E+05	6.93E+05	6.65E+05	0.59	5.23E-01	5.49E-02	0.76	5.20E-01	1.55E-01	4.74E+05	3.59E+05
2.54E+05	3.39E+05	1.87E+05	3.29E+05	3.51E+05	3.88E+05	0.55	4.85E-01	6.88E-02	0.76	4.90E-01	1.78E-01	2.92E+05	2.21E+05
5.72E+05	5.89E+05	3.40E+05	4.17E+05	5.05E+05	5.90E+05	0.56	3.91E-01	3.01E-02	0.76	4.62E-01	1.09E-01	5.04E+05	3.81E+05
1.46E+05	2.01E+05	1.38E+05	2.15E+05	2.36E+05	1.97E+05	0.58	4.02E-01	1.62E-02	0.76	3.74E-01	4.87E-02	1.70E+05	1.29E+05
4.00E+04	6.50E+04	4.67E+04	8.76E+04	8.07E+04	1.07E+05	0.59	5.58E-01	3.56E-02	0.75	5.92E-01	1.55E-01	7.64E+04	5.76E+04
3.91E+04	3.10E+04	4.24E+04	5.90E+04	5.39E+04	4.79E+04	0.57	4.29E-01	3.60E-02	0.75	3.94E-01	8.91E-02	4.36E+04	3.28E+04
5.90E+04	4.70E+04	6.37E+04	1.07E+05	8.23E+04	7.87E+04	0.59	5.07E-01	5.02E-02	0.75	5.13E-01	1.48E-01	6.52E+04	4.91E+04
1.50E+05	1.85E+05	1.09E+05	2.12E+05	2.49E+05	2.32E+05	0.60	5.01E-01	4.62E-02	0.75	5.09E-01	1.44E-01	1.67E+05	1.26E+05
3.79E+04	2.70E+04	2.70E+04	7.64E+04	4.58E+04	3.09E+04	0.56	6.10E-01	6.78E-02	0.75	6.54E-01	2.01E-01	4.34E+04	3.26E+04
8.14E+04	1.39E+05	1.32E+05	1.70E+05	1.72E+05	2.00E+05	0.58	4.26E-01	2.13E-02	0.75	3.92E-01	6.37E-02	1.42E+05	1.06E+05
1.31E+05	9.49E+04	1.15E+05	3.59E+05	2.74E+05	1.17E+05	0.57	7.50E-01	1.25E-01	0.75	8.24E-01	3.06E-01	1.56E+05	1.17E+05
7.71E+05	1.10E+06	7.42E+05	1.13E+06	1.44E+06	1.31E+06	0.58	4.40E-01	3.41E-02	0.75	4.33E-01	1.15E-01	1.05E+06	7.90E+05
1.33E+05	8.46E+04	1.11E+05	1.98E+05	1.51E+05	2.12E+05	0.57	6.36E-01	1.16E-01	0.75	6.90E-01	2.73E-01	1.35E+05	1.01E+05
9.79E+05	1.05E+06	2.62E+05	4.99E+05	7.58E+05	9.47E+05	0.59	7.35E-01	1.77E-01	0.75	9.43E-01	4.03E-01	6.89E+05	5.16E+05

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Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568939694	Serum paraoxonase/arylesterase 2	2	QPNMNLTLQLK	Deamidated(5)Oxidation(4)	2.68	2	602.3
124487171	Probable G-protein coupled receptor 116	3	ENVTCQDPIIGIDPGK	Carbamidomethyl(5)Deamidated(2)	3.28	2	907.4
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	LTVPSSQNSSFR	Deamidated(8)	2.99	2	662.3
29789020	H-2 class II histocompatibility antigen gamma chain	1	YGNMTQDHVMHLLTR	Deamidated(3)Oxidation(4)Oxidation(10)	4.08	3	617.0
124487171	Probable G-protein coupled receptor 116	3	LLQQQSNQSSQFLHSVER	Deamidated(7)	4.68	3	710.7
47078285	KDEL (Lys-Asp-Glu-Leu) containing 2 protein	1	YFFLQSVSDSDGRNFTSSPPGQTQF K	Deamidated(13)	4.86	3	952.1
568926396	Tenascin	12	EPEIGNLNVSDVTPK	Deamidated(6)Deamidated(8)	2.48	2	806.4
13385294	prenylcysteine oxidase 1	2	KMSNITFR	Deamidated(4)Oxidation(2)	2.57	2	507.3
755534805	N-acetylglucosamine-1-phosphotransferase	4	VTIVTHQDIFQNLSHLPTFSSPAIES HIHR	Deamidated(12)	5.17	5	686.0
6677905	Golgi apparatus protein 1	3	GNITEYQCHQYITK	Carbamidomethyl(8)Deamidated(2)	4.55	2	878.4
89242146	Niemann Pick type C1	6	LYNVTHQFCNASVMDPTCVR	Carbamidomethyl(9)Carbamidomethyl(18)Deamidated(3)Deamidated(10)Oxidation(14)	5.03	3	810.7
568913714	Angiopietin-related protein 2	2	FQHLAMLAHNQSEVIAQLEEHCCR	Carbamidomethyl(22)Deamidated(10)Oxidation(6)	5.9	4	727.3
6680878	Lysosome membrane protein	7	AYVFERNQSVGDPNVDLIR	Deamidated(7)	3.44	3	731.7
755530199	Integrin alpha-11	3	YIASDPDDKHFFNVTDEAALKDIVDALGDR	Deamidated(13)	4.9	4	838.7
160707889	Adipocyte enhancer-binding protein 1	1	GVVTDEQGIPIANATISVSGINHGVK	Deamidated(13)	5.71	3	859.8
153791270	Laminin subunit gamma-1	12	KYEQAKNISQDLEK	Deamidated(7)	5.69	3	565.6
21630263	Inhibitor of nuclear factor kappa-B kinase-interacting protein, isoform 2	2	QGTLNNTLTR	Deamidated(5)	3.65	2	559.8
153791389	Integrin alpha-1	13	LDLPVNTSIPNVTEIKENMTFGSTLV TNPK	Deamidated(11)Deamidated(18)Deamidated(28)Oxidation(19)	5.61	3	1097.6
755534805	N-acetylglucosamine-1-phosphotransferase	4	VPMLVLDPPLPANCTLK	Carbamidomethyl(14)Deamidated(13)Oxidation(3)	3.04	2	948.0
30089697	ADAMTS-like protein 4	2	EVQCLSGNQTLSSR	Carbamidomethyl(4)Deamidated(8)	3.83	2	790.4
124494256	Pro-low-density lipoprotein receptor-related protein 1	22	GVTHLNISGLK	Deamidated(6)	4.31	2	570.3
755522163	Integrin alpha-M	8	AVNQTGALYQCDYSTSR	Carbamidomethyl(11)Deamidated(3)	5.51	2	967.9

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1203.6	27.6	15	4.14E+05	2.91E+05	4.95E+05	6.52E+04	7.25E+05	6.16E+05	3.15E+05	3.10E+05	1.70E+05	1.44E+05	2.30E+05
1813.9	43.3	2	6.42E+04	5.72E+04	7.59E+04	1.07E+04	1.26E+05	1.01E+05	4.32E+04	3.13E+04	3.68E+04	1.42E+04	4.93E+04
1323.7	31.4	18	2.17E+06	2.49E+06	3.33E+06	1.53E+06	3.80E+06	3.33E+06	1.07E+06	2.16E+06	1.08E+06	1.94E+06	1.41E+06
1848.8	27.1	38	8.70E+05	4.18E+05	6.79E+05	1.23E+05	8.89E+05	7.35E+05	2.71E+05	5.01E+05	1.20E+05	2.00E+05	3.78E+05
2130.1	34.2	11	6.91E+05	5.72E+05	8.24E+05	2.94E+05	1.31E+06	1.16E+06	4.54E+05	6.81E+05	3.03E+05	2.49E+05	4.33E+05
2854.3	48.8	14	1.07E+05	1.60E+05	1.54E+05	8.43E+04	2.97E+05	3.11E+05	5.93E+04	1.11E+05	8.50E+04	3.56E+04	7.22E+04
1611.8	41.8	79	8.60E+06	1.02E+07	2.02E+07	1.21E+07	2.05E+07	1.77E+07	4.68E+06	1.77E+07	6.93E+06	6.50E+06	9.35E+06
1013.5	22.8	5	5.41E+05	3.69E+05	6.45E+05	9.17E+02	8.01E+05	7.40E+05	3.47E+05	3.63E+05	1.54E+05	1.73E+05	2.53E+05
3425.8	49.4	6	3.18E+04	3.24E+04	1.10E+05	2.16E+04	6.49E+04	6.10E+04	2.91E+03	4.13E+04	1.30E+04	6.18E+03	2.70E+04
1755.8	27.6	26	2.72E+05	1.90E+05	3.56E+05	1.15E+05	4.18E+05	3.80E+05	1.87E+05	1.81E+05	1.06E+05	7.12E+04	1.76E+05
2430.1	39.4	9	9.85E+04	1.20E+05	1.98E+05	3.46E+04	2.38E+05	2.41E+05	1.12E+05	1.05E+05	4.60E+04	4.41E+04	8.30E+04
2906.4	40.1	17	1.40E+05	1.50E+05	3.45E+05	8.15E+04	4.87E+05	4.28E+05	2.36E+04	1.99E+05	6.56E+04	5.74E+04	2.12E+05
2193.1	41.8	15	7.16E+05	3.45E+05	7.20E+05	2.75E+05	7.16E+05	7.46E+05	1.59E+05	3.42E+05	2.00E+05	2.37E+05	1.85E+05
3351.6	59.9	9	1.43E+05	2.18E+05	2.69E+05	1.31E+05	2.48E+05	1.70E+05	7.30E+03	1.15E+05	3.86E+04	2.61E+04	8.02E+04
2577.4	45.8	69	3.35E+06	6.20E+06	8.42E+06	3.97E+06	6.66E+06	6.67E+06	1.24E+06	6.15E+06	2.96E+06	1.72E+06	4.30E+06
1694.9	24.4	5	1.94E+05	6.42E+04	1.52E+05	0.00E+00	4.16E+05	3.42E+05	6.58E+04	7.17E+04	7.22E+04	8.58E+04	2.05E+04
1118.6	26.3	18	9.44E+05	7.88E+05	8.92E+05	3.94E+03	1.23E+06	1.05E+06	5.09E+05	7.41E+05	3.12E+05	2.71E+05	4.12E+05
3290.7	55.6	25	1.86E+05	3.22E+05	4.53E+05	1.24E+05	5.07E+05	4.77E+05	5.44E+04	2.96E+05	9.40E+04	5.26E+04	2.27E+05
1895.0	53.3	1	6.54E+04	9.73E+04	1.68E+05	5.14E+04	1.87E+05	1.49E+05	4.47E+04	9.68E+04	5.22E+04	3.69E+04	7.40E+04
1579.7	27.6	18	1.97E+05	1.64E+05	2.97E+05	1.11E+05	5.29E+05	4.49E+05	1.85E+05	1.87E+05	9.38E+04	1.03E+05	1.66E+05
1139.6	32.9	16	6.96E+05	1.21E+06	1.12E+06	4.10E+05	1.05E+06	9.18E+05	6.80E+05	6.05E+05	3.28E+05	2.10E+05	4.93E+05
1934.9	31.6	18	1.79E+05	2.52E+05	2.55E+05	1.34E+05	2.15E+05	2.34E+05	1.89E+05	1.08E+05	1.23E+05	6.72E+04	1.31E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.54E+05	1.73E+05	1.95E+05	3.43E+05	2.71E+05	2.06E+05	0.57	4.89E-01	5.08E-02	0.75	4.60E-01	1.17E-01	2.11E+05	1.58E+05
2.08E+04	1.68E+04	4.84E+04	4.49E+04	1.68E+04	6.65E+04	0.57	6.66E-01	8.46E-02	0.75	7.11E-01	2.24E-01	3.40E+04	2.54E+04
9.68E+05	1.20E+06	8.77E+05	1.17E+06	1.56E+06	1.16E+06	0.55	3.84E-01	1.46E-02	0.75	5.13E-01	9.96E-02	1.32E+06	9.85E+05
9.62E+04	3.68E+05	2.27E+05	3.23E+05	3.20E+05	3.93E+05	0.56	5.34E-01	6.22E-02	0.74	6.09E-01	2.01E-01	2.85E+05	2.12E+05
3.02E+05	3.74E+05	3.67E+05	5.04E+05	4.79E+05	4.41E+05	0.56	4.10E-01	3.33E-02	0.74	3.58E-01	7.85E-02	3.92E+05	2.92E+05
4.06E+04	9.86E+04	7.62E+04	1.56E+05	9.19E+04	1.30E+05	0.58	6.19E-01	8.27E-02	0.74	6.27E-01	1.85E-01	8.53E+04	6.34E+04
7.60E+06	9.33E+06	3.97E+06	5.77E+06	8.59E+06	8.58E+06	0.57	4.02E-01	2.22E-02	0.74	5.09E-01	1.28E-01	7.58E+06	5.63E+06
2.16E+05	2.05E+05	2.13E+05	3.48E+05	2.83E+05	2.64E+05	0.56	4.61E-01	6.05E-02	0.74	4.50E-01	1.51E-01	2.45E+05	1.82E+05
1.55E+04	1.60E+04	2.47E+04	4.33E+04	2.98E+04	2.98E+04	0.57	7.12E-01	1.50E-01	0.74	7.95E-01	3.22E-01	2.34E+04	1.73E+04
8.32E+04	1.41E+05	1.19E+05	1.57E+05	2.23E+05	1.37E+05	0.56	4.69E-01	2.90E-02	0.74	4.29E-01	6.53E-02	1.36E+05	1.01E+05
5.05E+04	7.69E+04	5.79E+04	8.14E+04	9.78E+04	9.95E+04	0.56	4.79E-01	5.32E-02	0.74	4.44E-01	1.23E-01	7.33E+04	5.43E+04
6.79E+04	1.08E+05	8.12E+04	1.21E+05	1.55E+05	1.43E+05	0.55	6.74E-01	1.36E-01	0.74	7.40E-01	2.90E-01	1.16E+05	8.61E+04
2.55E+05	1.75E+05	2.17E+05	4.30E+05	3.48E+05	2.20E+05	0.55	4.80E-01	3.90E-02	0.74	5.23E-01	1.27E-01	2.62E+05	1.93E+05
4.54E+04	1.07E+05	3.57E+04	1.28E+05	1.33E+05	1.27E+05	0.57	6.41E-01	8.24E-02	0.74	7.09E-01	2.30E-01	8.27E+04	6.09E+04
2.62E+06	3.54E+06	1.54E+06	2.85E+06	3.32E+06	3.57E+06	0.58	4.49E-01	2.66E-02	0.74	5.23E-01	1.29E-01	2.95E+06	2.18E+06
1.02E+05	4.08E+04	4.62E+04	2.06E+05	1.22E+05	2.37E+04	0.53	8.97E-01	1.92E-01	0.74	1.07E+00	4.09E-01	8.25E+04	6.08E+04
2.85E+05	4.12E+05	3.28E+05	4.86E+05	5.67E+05	5.22E+05	0.57	4.57E-01	4.49E-02	0.74	4.24E-01	1.19E-01	4.11E+05	3.02E+05
1.36E+05	1.01E+05	1.45E+05	2.43E+05	2.27E+05	1.25E+05	0.56	5.95E-01	7.83E-02	0.73	6.53E-01	2.07E-01	1.56E+05	1.15E+05
4.57E+04	5.63E+04	4.66E+04	6.17E+04	6.73E+04	6.39E+04	0.56	4.23E-01	3.97E-02	0.73	4.03E-01	9.69E-02	5.73E+04	4.20E+04
8.91E+04	1.45E+05	8.92E+04	1.69E+05	1.63E+05	1.40E+05	0.54	4.72E-01	5.75E-02	0.73	4.56E-01	1.18E-01	1.35E+05	9.86E+04
2.99E+05	3.58E+05	3.58E+05	6.05E+05	6.75E+05	5.88E+05	0.58	4.44E-01	1.65E-02	0.73	4.28E-01	6.52E-02	4.44E+05	3.25E+05
1.04E+05	1.11E+05	7.85E+04	1.20E+05	1.06E+05	1.30E+05	0.56	2.91E-01	2.12E-03	0.73	3.05E-01	1.49E-02	1.08E+05	7.91E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
6681143	Decorin	3	YIQVVYLHNNNISAVGQNDFCR	Carbamidomethyl(21)Deamidated(10))Deamidated(11)	3.18	4	657.1
755498697	Fibrillin-1	5	NYYADNQTCDGELLFNMTKK	Carbamidomethyl(9)Deamidated(6)D eamidated(16)Oxidation(17)	4.24	3	815.0
568912521	Plexin domain containing 2	1	GFTDLLLDDGQDNNTQIEEDTDHNY YISR	Deamidated(13)	8.57	3	1134.8
755522163	Integrin alpha-M	8	YLNFTASEMTSK	Deamidated(3)Oxidation(9)	2.94	2	704.8
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	YHYNGTFEDGKK	Deamidated(4)	4.4	3	487.2
124494256	Prolow-density lipoprotein receptor-related protein 1	22	VDIPQQPMGIIAVANDTNSCELSPC R	Carbamidomethyl(20)Carbamidomet hyl(25)Deamidated(15)Deamidated(18)Oxidation(8)	6.27	3	968.1
269315863	Collagen alpha-5(VI)	7	DLQNFLNVTSSVDVK	Deamidated(8)	4.63	2	904.9
34328108	Collagen alpha-1(I) chain	1	LMSTEASQNITYHCK	Carbamidomethyl(14)Deamidated(9) Oxidation(2)	4.82	3	600.6
6679731	Coagulation factor V	1	VSTVTLVSATSTTANMTMSPEGR	Deamidated(15)Oxidation(16)Oxidati on(18)	3.89	3	792.0
254588077	Multimerin-1	3	LNQLNFQNIYQLFNETTSQVNK	Deamidated(14)	5.39	3	886.4
568958751	Hypoxia up-regulated protein	7	AEPPLNASAGDQEEK	Deamidated(6)	3.07	2	778.9
225903442	Integrin alpha-5	6	IYLRNESEFR	Deamidated(5)	3.33	2	664.3
224922773	Olfactomedin-like protein 2B	2	VDKLEEEVSKNLTK	Deamidated(11)	3.19	3	545.0
22203747	Collagen alpha-2(VI) chain	6	RGTFTDCALANMTQQIR	Carbamidomethyl(7)Deamidated(11) Oxidation(12)	4.74	3	667.3
6677691	Reticulocalbin-1	1	VVRPDELGERPPEDNQSFDYDHE AFLGKEDSK	Deamidated(16)	5.99	5	764.8
124301217	VPS10 domain-containing receptor SorCS2	1	AMYVNLTLTGEPPIR	Deamidated(5)Oxidation(2)	4.25	2	797.9
755522163	Integrin alpha-M	8	IQCDLPSFNTQEIFNVTLK	Carbamidomethyl(3)Deamidated(15)	3.97	3	756.7
13385482	Tetraspanin-31	1	SFDCCGFLNLTTLR	Carbamidomethyl(4)Carbamidometh yl(5)Deamidated(9)	4.22	2	852.9
46849812	Fibronectin	10	DQCIVDDITYNVNDTFHKR	Carbamidomethyl(3)Carbamyl(18)De amidated(13)	6.52	3	785.4
45504394	Integrin beta-1	7	NPCTSEQNCTSPFSYK	Carbamidomethyl(3)Carbamidometh yl(9)Deamidated(8)	5.1	2	960.9
568958751	Hypoxia up-regulated protein	7	ENGTDVAVQEEEESPAEGSK	Deamidated(2)	4.01	2	1003.9
597508192	Macrosialin	1	ELQAPLGQSFCCGNASIVLSPAVHL DLLSLR	Carbamidomethyl(11)Carbamidomet hyl(12)Deamidated(14)	6.41	4	842.4
568954797	Teneurin-3	2	LTNVTFPTGVVTLNLHGDMDK	Deamidated(3)Oxidation(18)	3.89	3	726.0
392871558	Receptor-type tyrosine-protein phosphatase C	3	TSRPTDNSINVTGPPYETNGPK	Carbamidomethyl(13)Deamidated(10)Deamidated(20)	5.58	3	836.1
153791389	Integrin alpha-1	13	DSCESNQNITCR	Carbamidomethyl(3)Carbamidometh yl(11)Deamidated(8)	2.87	2	742.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2625.3	43.9	103	2.88E+05	2.01E+05	9.69E+05	2.74E+05	9.17E+05	9.13E+05	1.37E+05	6.95E+05	1.42E+05	1.36E+05	5.88E+05
2443.0	39.0	10	6.14E+05	2.71E+05	3.69E+05	2.37E+05	1.22E+06	9.94E+05	2.02E+05	4.34E+05	1.41E+05	2.65E+05	2.56E+05
3402.5	53.3	17	5.69E+05	7.10E+05	7.80E+05	2.76E+05	6.42E+05	6.40E+05	1.01E+05	4.61E+05	2.37E+05	1.39E+05	3.49E+05
1408.6	34.8	18	6.57E+05	9.18E+05	1.16E+06	4.87E+05	1.06E+06	1.02E+06	5.26E+05	6.56E+05	5.71E+05	2.07E+05	4.93E+05
1459.6	21.4	23	1.43E+06	1.75E+06	1.39E+06	6.52E+03	1.26E+06	1.24E+06	1.12E+06	6.96E+05	4.37E+05	1.27E+05	3.95E+05
2902.3	49.5	15	1.92E+05	2.85E+05	3.44E+05	1.48E+05	4.63E+05	5.52E+05	1.52E+05	2.42E+05	1.50E+05	8.66E+04	2.28E+05
1808.9	67.8	27	1.52E+05	1.21E+05	1.97E+05	6.63E+04	1.80E+05	2.02E+05	3.57E+04	1.54E+05	4.88E+04	4.56E+04	8.87E+04
1799.8	23.7	34	7.31E+05	7.07E+05	8.33E+05	0.00E+00	1.69E+06	1.47E+06	5.00E+05	4.59E+05	2.03E+05	1.90E+05	3.88E+05
2374.1	36.9	11	6.86E+05	3.19E+05	8.63E+05	3.04E+05	1.22E+06	1.18E+06	2.54E+05	5.43E+05	1.05E+05	2.61E+05	3.75E+05
2657.3	66.3	3	4.56E+04	1.88E+05	1.60E+05	5.76E+04	1.40E+05	1.39E+05	9.15E+03	1.10E+05	7.48E+04	2.70E+04	5.85E+04
1556.7	25.4	28	7.03E+05	8.60E+05	8.21E+05	1.12E+04	1.14E+06	9.37E+05	7.82E+05	5.96E+05	3.61E+05	1.76E+05	3.86E+05
1327.7	29.8	17	1.56E+05	1.60E+05	2.13E+05	8.31E+04	2.84E+05	2.33E+05	8.15E+04	1.17E+05	5.94E+04	4.33E+04	1.08E+05
1632.9	30.8	7	8.04E+04	1.18E+05	1.26E+05	4.29E+04	1.51E+05	1.12E+05	4.63E+04	1.01E+05	3.11E+04	3.12E+04	4.08E+04
1999.9	32.5	29	1.77E+06	1.19E+06	4.91E+06	1.07E+06	5.56E+06	5.05E+06	1.66E+06	2.00E+06	9.80E+05	1.04E+06	1.17E+06
3819.8	34.5	4	1.64E+05	1.14E+05	2.24E+05	8.85E+04	3.10E+05	2.82E+05	4.08E+04	9.59E+04	4.59E+04	4.65E+04	4.73E+04
1594.8	46.1	15	2.47E+05	3.42E+05	3.91E+05	1.88E+05	2.79E+05	2.15E+05	5.34E+04	2.35E+05	1.16E+05	2.44E+04	1.75E+05
2268.1	60.9	7	6.84E+04	1.43E+05	2.16E+05	7.08E+04	1.19E+05	1.24E+05	1.24E+04	8.79E+04	4.55E+04	5.47E+03	7.26E+04
1704.8	58.2	15	7.82E+04	1.35E+05	2.29E+05	4.26E+04	2.81E+05	2.36E+05	4.65E+04	1.07E+05	4.94E+04	3.11E+04	1.29E+05
2354.1	45.1	21	7.58E+04	1.01E+05	1.12E+05	4.38E+04	1.54E+05	1.59E+05	2.22E+04	4.86E+04	1.62E+04	3.78E+04	5.21E+04
1920.8	31.9	20	4.04E+05	4.55E+05	6.16E+05	1.74E+05	8.94E+05	8.16E+05	4.86E+05	3.20E+05	1.94E+05	1.26E+05	4.02E+05
2006.8	22.6	10	3.77E+04	1.04E+05	5.95E+04	1.69E+03	1.13E+05	9.75E+04	1.38E+05	8.32E+04	4.67E+04	1.07E+04	3.65E+04
3366.7	64.9	26	9.57E+04	1.85E+05	3.54E+05	4.16E+04	1.77E+05	1.71E+05	6.79E+04	1.34E+05	1.10E+04	6.45E+03	4.25E+04
2176.1	43.1	3	8.41E+04	1.83E+05	1.47E+05	9.29E+03	2.91E+05	2.20E+05	9.21E+04	1.97E+05	7.72E+04	6.06E+04	8.68E+04
2506.2	30.5	39	2.68E+05	3.20E+05	3.77E+05	1.30E+05	2.74E+05	2.93E+05	1.72E+05	1.38E+05	9.89E+04	5.72E+04	1.42E+05
1484.6	19.1	1	1.90E+05	1.75E+05	1.83E+05	0.00E+00	4.03E+05	5.54E+03	2.54E+05	1.26E+05	4.46E+04	2.57E+04	5.74E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
7.91E+04	2.43E+05	1.44E+05	2.89E+05	3.74E+05	4.31E+05	0.57	7.48E-01	1.33E-01	0.73	8.73E-01	3.16E-01	2.80E+05	2.04E+05
1.94E+05	2.23E+05	1.75E+05	3.88E+05	3.96E+05	2.21E+05	0.53	5.71E-01	1.05E-01	0.73	6.19E-01	2.30E-01	2.70E+05	1.97E+05
1.56E+05	2.85E+05	1.91E+05	3.39E+05	4.33E+05	3.81E+05	0.58	5.03E-01	3.72E-02	0.73	5.11E-01	1.18E-01	2.83E+05	2.06E+05
4.26E+05	3.67E+05	3.13E+05	6.65E+05	5.74E+05	5.75E+05	0.58	3.84E-01	5.84E-03	0.73	3.79E-01	2.97E-02	4.56E+05	3.31E+05
3.64E+05	7.69E+05	4.99E+05	9.16E+05	8.49E+05	8.72E+05	0.58	5.88E-01	5.85E-02	0.73	6.58E-01	1.82E-01	5.95E+05	4.32E+05
1.05E+05	1.55E+05	1.09E+05	1.63E+05	2.02E+05	2.06E+05	0.56	4.79E-01	3.86E-02	0.72	4.61E-01	8.59E-02	1.59E+05	1.15E+05
3.57E+04	7.72E+04	3.81E+04	5.68E+04	7.83E+04	1.65E+05	0.57	6.10E-01	5.14E-02	0.72	6.56E-01	1.65E-01	7.33E+04	5.29E+04
3.26E+05	4.78E+05	2.85E+05	3.21E+05	4.25E+05	6.96E+05	0.53	6.06E-01	1.04E-01	0.72	6.53E-01	2.20E-01	3.97E+05	2.86E+05
2.31E+05	2.32E+05	2.48E+05	4.21E+05	4.05E+05	3.84E+05	0.53	4.90E-01	6.90E-02	0.72	5.03E-01	1.73E-01	3.29E+05	2.36E+05
8.25E+04	3.08E+04	4.92E+04	7.77E+04	6.53E+04	7.98E+04	0.57	5.42E-01	6.46E-02	0.72	6.72E-01	2.10E-01	6.08E+04	4.37E+04
2.37E+05	3.93E+05	3.33E+05	5.30E+05	4.82E+05	5.84E+05	0.57	4.78E-01	3.19E-02	0.72	4.56E-01	7.62E-02	3.96E+05	2.84E+05
7.02E+04	6.27E+04	6.57E+04	1.19E+05	1.11E+05	8.99E+04	0.54	4.48E-01	2.76E-02	0.72	4.17E-01	5.62E-02	8.57E+04	6.14E+04
4.57E+04	4.84E+04	3.31E+04	7.29E+04	5.44E+04	6.91E+04	0.55	4.28E-01	2.21E-02	0.72	4.50E-01	8.30E-02	5.10E+04	3.65E+04
9.42E+05	1.27E+06	1.20E+06	2.16E+06	2.17E+06	1.43E+06	0.53	5.53E-01	8.55E-02	0.72	5.58E-01	1.79E-01	1.46E+06	1.05E+06
6.25E+04	5.04E+04	6.73E+04	1.57E+05	1.71E+05	4.70E+04	0.54	6.94E-01	8.72E-02	0.72	7.36E-01	2.06E-01	8.23E+04	5.88E+04
1.02E+05	1.13E+05	9.21E+04	1.52E+05	1.81E+05	2.21E+05	0.58	5.34E-01	3.46E-02	0.71	5.78E-01	1.21E-01	1.33E+05	9.51E+04
4.26E+04	4.30E+04	4.10E+04	8.28E+04	7.55E+04	8.77E+04	0.57	6.34E-01	8.46E-02	0.71	6.90E-01	1.99E-01	5.63E+04	4.02E+04
3.70E+04	7.05E+04	4.95E+04	6.21E+04	1.05E+05	9.71E+04	0.54	6.34E-01	9.31E-02	0.71	6.77E-01	1.95E-01	7.38E+04	5.26E+04
6.64E+04	2.58E+04	2.16E+04	4.39E+04	4.56E+04	3.65E+04	0.51	5.08E-01	5.73E-02	0.71	6.91E-01	1.98E-01	4.42E+04	3.15E+04
1.57E+05	2.72E+05	2.03E+05	2.61E+05	3.42E+05	3.18E+05	0.54	4.74E-01	3.17E-02	0.71	4.60E-01	6.21E-02	2.68E+05	1.90E+05
1.94E+04	4.91E+04	4.06E+04	5.17E+04	6.06E+04	8.24E+04	0.58	6.28E-01	7.48E-02	0.71	6.70E-01	1.75E-01	4.44E+04	3.14E+04
3.50E+04	3.44E+04	7.38E+04	1.29E+05	1.52E+05	1.46E+05	0.56	8.35E-01	1.54E-01	0.71	9.52E-01	3.21E-01	7.61E+04	5.38E+04
6.51E+04	6.09E+04	6.14E+04	8.78E+04	1.18E+05	9.72E+04	0.55	4.80E-01	5.86E-02	0.70	4.72E-01	1.41E-01	8.39E+04	5.89E+04
7.98E+04	1.34E+05	8.52E+04	1.47E+05	1.59E+05	2.03E+05	0.55	4.41E-01	1.48E-02	0.70	4.37E-01	4.76E-02	1.30E+05	9.14E+04
4.81E+04	8.10E+04	7.95E+04	1.13E+05	1.16E+05	1.44E+05	0.54	7.14E-01	1.53E-01	0.70	7.47E-01	2.59E-01	8.52E+04	5.98E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568972029	C-type mannose receptor 2	6	KKPNATVEPIQPDR	Deamidated(4)	3.67	2	797.4
160333372	Lumican	5	KLHINYNNLTESVGPLPK	Deamidated(8)	4.32	3	680.4
19527236	Transmembrane emp24 domain-containing protein 4	1	FTFTSHTPGDHQICLHSNSTR	Carbamidomethyl(14)Deamidated(18)	6.89	5	489.6
239915968	Thrombospondin 3	1	LGFLGNQSQGCVPAR	Carbamidomethyl(11)Deamidated(6)	3.86	2	802.9
124494256	Prolow-density lipoprotein receptor-related protein 1	22	DGSCIGNSSR	Carbamidomethyl(4)Deamidated(7)	2.78	2	527.2
568967343	tetraspanin 8	1	ILNETLYENAK	Deamidated(3)	3.36	2	654.8
6755106	Procollagen-lysine,2-oxoglutarate 5-dioxygenase 1	1	EQINISLDHR	Deamidated(4)	2.91	2	613.3
156231021	Kininogen-1	2	IANFSQSCTLYSGDDLVEALPKPCP GCPR	Carbamidomethyl(8)Carbamidomethyl(24)Carbamidomethyl(27)Deamidated(3)	3.29	3	1085.2
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	NHTYNTYVGQGYIIPGMDQGLQGA CIGER	Carbamidomethyl(25)Deamidated(1) Oxidation(17)	5.48	3	1077.2
568960005	Choline transporter-like protein 2	3	TCNPETFPLRNESLQCPTAR	Carbamidomethyl(2)Carbamidomethyl(16)Deamidated(11)	3.91	3	798.0
124494256	Prolow-density lipoprotein receptor-related protein 1	22	DNTTCYEFK	Carbamidomethyl(5)Deamidated(2)	2.65	2	589.7
568908031	Prolargin	3	INGTQICPNNLVAFHDFSSDLENVP HLR	Carbamidomethyl(7)Deamidated(2)	8.51	4	802.9
568958751	Hypoxia up-regulated protein	7	VFGSQNLTTVK	Deamidated(6)	2.9	2	597.8
172072617	Peptidyl-prolyl cis-trans isomerase FKBP9	3	YHYNGTFLDGTLDSSSHNR	Deamidated(4)	7.96	3	749.0
170172530	Immunoglobulin joining chain	2	ENISDPTSPLR	Deamidated(2)	3.33	2	615.3
19527206	CD276 antigen	3	VVLGANGTYSCLVR	Carbamidomethyl(11)Deamidated(6)	3.94	2	755.4
568956035	Cadherin-11	1	FIFSLPPEIMHNPFTVR	Deamidated(14)Oxidation(10)	3.93	3	726.0
568936922	P2X purinoceptor 4	4	TSICDSANCTLGSSDTHSSGIGTG R	Carbamidomethyl(4)Carbamidomethyl(10)Deamidated(9)	5.46	3	886.4
46849812	Fibronectin	10	ITTTPTNGQQGTSLEEVVHADQSSC TFENLNPGLEYNVSVYTVK	Carbamidomethyl(25)Deamidated(29) Deamidated(37)	6.83	3	1610.8
569001628	Inactive tyrosine-protein kinase 7	3	DNVTGEEVR	Deamidated(2)	2.69	2	510.2
568955184	Cytokine receptor-like factor 1	2	VVDDVSNQTSCR	Carbamidomethyl(11)Deamidated(7)	3.42	2	690.8
568958751	Hypoxia up-regulated protein	7	NATLAEQAK	Deamidated(1)	3.07	2	473.7
45504394	Integrin beta-1	7	DTCAQECSHFNLTk	Carbamidomethyl(3)Carbamidomethyl(7)Deamidated(11)	4.36	3	571.2
124494256	Prolow-density lipoprotein receptor-related protein 1	22	LNGTDPIVAADSKR	Deamidated(2)	4.61	3	486.6
153791389	Integrin alpha-1	13	YNHTGQVVIYK	Deamidated(2)	3.49	2	661.8

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1593.9	21.8	28	8.85E+05	7.86E+05	9.43E+05	6.93E+02	1.03E+06	9.74E+05	7.92E+05	5.47E+05	2.55E+05	1.41E+05	3.41E+05
2039.1	38.1	248	8.58E+04	1.03E+05	2.18E+05	1.26E+05	3.49E+05	2.93E+05	4.92E+04	2.30E+05	7.76E+04	9.43E+04	1.29E+05
2444.1	29.5	45	5.07E+05	4.36E+05	9.41E+05	1.53E+05	1.12E+06	9.95E+05	2.91E+05	4.20E+05	1.62E+05	1.61E+05	4.78E+05
1604.8	39.0	21	2.88E+05	3.99E+05	7.44E+05	2.55E+05	8.22E+05	8.28E+05	4.24E+05	4.96E+05	1.95E+05	1.71E+05	4.10E+05
1053.4	16.8	2	1.07E+05	9.39E+04	1.36E+05	0.00E+00	2.18E+05	1.17E+04	1.26E+05	8.29E+04	3.71E+04	1.66E+04	4.01E+04
1308.7	35.3	5	9.74E+04	1.01E+05	8.35E+04	4.73E+04	1.45E+05	1.28E+05	8.10E+04	9.24E+04	4.98E+04	2.52E+04	5.50E+04
1225.6	31.2	19	1.75E+05	3.54E+05	2.66E+05	1.59E+05	4.28E+05	4.03E+05	1.16E+05	1.58E+05	1.01E+05	5.84E+04	1.38E+05
3253.5	50.3	6	5.91E+04	9.29E+04	1.54E+05	1.20E+04	2.45E+05	2.19E+05	4.41E+04	6.25E+04	1.37E+04	2.84E+04	6.67E+04
3229.5	45.7	13	9.33E+04	2.15E+05	1.37E+05	4.20E+04	1.19E+05	8.71E+04	4.95E+04	4.99E+04	4.57E+04	1.29E+04	2.70E+04
2392.1	36.2	12	2.04E+05	2.93E+05	4.92E+05	8.37E+04	5.50E+05	4.79E+05	2.39E+05	1.99E+05	9.29E+04	6.56E+04	2.16E+05
1178.5	29.2	7	9.94E+04	1.43E+05	1.53E+05	5.35E+04	2.11E+05	2.02E+05	1.40E+05	1.10E+05	7.83E+04	3.54E+04	6.21E+04
3208.6	53.7	17	1.65E+05	1.50E+05	3.14E+05	1.20E+05	5.31E+05	5.29E+05	3.08E+04	1.86E+05	1.41E+05	1.09E+05	1.56E+05
1194.6	34.3	27	2.08E+06	3.67E+06	4.00E+06	2.24E+06	4.82E+06	4.45E+06	3.07E+06	2.54E+06	1.69E+06	7.32E+05	1.81E+06
2245.0	44.1	88	1.93E+06	3.50E+06	3.29E+06	1.68E+06	2.78E+06	2.58E+06	1.08E+06	1.56E+06	1.11E+06	3.93E+05	1.14E+06
1229.6	32.3	14	4.11E+05	1.91E+05	2.20E+05	1.57E+05	6.67E+05	6.74E+05	2.73E+05	2.51E+05	1.61E+05	1.35E+05	1.94E+05
1509.8	40.9	13	1.27E+05	1.78E+05	2.50E+05	7.06E+04	2.14E+05	1.56E+05	8.88E+04	1.04E+05	5.59E+04	3.50E+04	7.77E+04
2176.1	54.1	24	2.88E+05	4.81E+05	6.00E+05	1.39E+05	6.24E+05	6.20E+05	9.58E+04	4.86E+05	1.33E+05	8.18E+04	2.26E+05
2657.1	28.1	3	7.36E+04	8.90E+04	1.30E+05	2.81E+04	1.18E+05	1.20E+05	9.29E+04	5.39E+04	2.58E+04	1.59E+04	5.83E+04
4830.3	55.5	45	1.42E+06	3.71E+06	5.19E+06	2.17E+06	3.66E+06	3.54E+06	1.45E+05	1.63E+06	8.98E+05	4.99E+05	1.84E+06
1019.5	19.5	7	1.87E+05	1.94E+05	2.63E+05	7.74E+03	2.46E+05	2.18E+05	1.76E+05	2.01E+05	9.17E+04	3.41E+04	1.07E+05
1380.6	19.9	10	9.39E+04	1.08E+05	1.34E+05	0.00E+00	2.13E+05	1.72E+05	9.75E+04	7.29E+04	2.88E+04	1.95E+04	5.64E+04
946.5	20.4	3	6.37E+04	8.96E+04	1.17E+05	2.90E+01	1.37E+05	1.33E+05	9.71E+04	7.53E+04	3.37E+04	1.25E+04	4.42E+04
1711.7	28.1	23	2.78E+05	2.32E+05	5.75E+05	8.69E+04	6.78E+05	5.44E+05	3.53E+05	2.62E+05	1.01E+05	1.03E+05	2.64E+05
1457.8	27.7	6	2.09E+05	8.60E+04	7.11E+04	7.10E+04	1.73E+05	1.44E+05	5.08E+04	7.40E+04	4.55E+04	3.58E+04	3.62E+04
1322.7	26.2	7	1.33E+05	1.26E+05	1.96E+05	3.44E+04	2.25E+05	1.83E+05	1.22E+05	1.03E+05	5.73E+04	3.34E+04	6.58E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.70E+05	3.59E+05	2.75E+05	5.86E+05	5.64E+05	4.83E+05	0.55	5.05E-01	3.46E-02	0.70	5.02E-01	8.33E-02	3.90E+05	2.73E+05
6.22E+04	7.16E+04	5.24E+04	8.43E+04	1.18E+05	1.12E+05	0.53	4.93E-01	5.68E-02	0.70	5.59E-01	1.48E-01	9.61E+04	6.73E+04
1.81E+05	2.46E+05	2.46E+05	2.92E+05	3.75E+05	3.47E+05	0.52	5.32E-01	6.49E-02	0.70	5.58E-01	1.38E-01	3.05E+05	2.13E+05
1.25E+05	3.43E+05	1.54E+05	3.26E+05	3.22E+05	2.54E+05	0.53	4.74E-01	2.58E-02	0.70	5.12E-01	7.30E-02	2.77E+05	1.94E+05
3.25E+04	5.53E+04	2.96E+04	8.32E+04	7.17E+04	6.63E+04	0.55	6.72E-01	1.22E-01	0.70	6.89E-01	2.07E-01	5.09E+04	3.56E+04
3.30E+04	4.78E+04	4.07E+04	6.61E+04	6.62E+04	7.13E+04	0.55	3.77E-01	5.48E-03	0.70	3.33E-01	1.33E-02	5.28E+04	3.69E+04
9.31E+04	1.26E+05	1.12E+05	1.57E+05	1.30E+05	2.10E+05	0.53	4.67E-01	3.17E-02	0.70	4.63E-01	7.48E-02	1.34E+05	9.38E+04
4.57E+04	4.51E+04	2.76E+04	6.07E+04	3.18E+04	9.80E+04	0.50	6.73E-01	1.30E-01	0.70	7.74E-01	2.72E-01	5.32E+04	3.71E+04
2.14E+04	6.39E+04	3.72E+04	8.24E+04	1.03E+05	7.52E+04	0.57	7.00E-01	9.43E-02	0.70	7.98E-01	2.37E-01	5.38E+04	3.75E+04
1.15E+05	1.43E+05	1.03E+05	1.61E+05	1.72E+05	2.55E+05	0.53	5.24E-01	4.92E-02	0.70	5.30E-01	1.03E-01	1.61E+05	1.12E+05
5.05E+04	9.24E+04	5.06E+04	1.01E+05	9.69E+04	8.74E+04	0.54	4.09E-01	1.03E-02	0.70	3.92E-01	2.30E-02	7.57E+04	5.28E+04
6.85E+04	1.06E+05	8.99E+04	2.34E+05	1.72E+05	7.50E+04	0.52	6.27E-01	1.01E-01	0.70	6.68E-01	1.91E-01	1.34E+05	9.32E+04
1.15E+06	1.45E+06	1.53E+06	2.34E+06	2.24E+06	2.50E+06	0.54	3.86E-01	5.18E-03	0.69	3.30E-01	7.55E-03	1.80E+06	1.25E+06
8.70E+05	1.28E+06	9.82E+05	1.61E+06	1.44E+06	1.69E+06	0.54	4.24E-01	1.27E-02	0.69	4.46E-01	4.89E-02	1.24E+06	8.57E+05
9.21E+04	2.00E+05	1.36E+05	1.99E+05	7.25E+04	3.47E+05	0.51	5.74E-01	5.36E-02	0.69	6.02E-01	1.13E-01	1.85E+05	1.27E+05
4.95E+04	8.18E+04	4.16E+04	9.12E+04	1.13E+05	9.59E+04	0.53	4.57E-01	2.11E-02	0.68	4.49E-01	4.89E-02	7.79E+04	5.32E+04
1.40E+05	1.68E+05	1.57E+05	2.94E+05	3.34E+05	2.59E+05	0.54	5.32E-01	4.92E-02	0.68	5.54E-01	1.23E-01	2.19E+05	1.50E+05
1.72E+04	5.87E+04	2.90E+04	4.35E+04	4.54E+04	7.08E+04	0.52	4.98E-01	2.17E-02	0.68	5.37E-01	6.41E-02	4.51E+04	3.07E+04
1.39E+06	1.59E+06	7.21E+05	1.19E+06	1.36E+06	1.54E+06	0.51	5.16E-01	5.88E-02	0.68	6.28E-01	1.57E-01	1.38E+06	9.40E+05
5.28E+04	1.24E+05	7.58E+04	1.19E+05	1.29E+05	1.23E+05	0.54	4.53E-01	1.89E-02	0.68	4.86E-01	5.95E-02	1.02E+05	6.95E+04
5.18E+04	4.80E+04	4.06E+04	7.64E+04	4.59E+04	7.61E+04	0.51	5.10E-01	5.45E-02	0.68	5.42E-01	1.09E-01	5.62E+04	3.81E+04
2.45E+04	4.95E+04	4.43E+04	6.04E+04	5.72E+04	5.60E+04	0.53	4.91E-01	3.54E-02	0.68	5.11E-01	7.43E-02	4.68E+04	3.16E+04
8.61E+04	1.73E+05	1.22E+05	2.14E+05	1.86E+05	2.51E+05	0.51	5.01E-01	4.40E-02	0.68	5.13E-01	8.43E-02	1.89E+05	1.28E+05
4.36E+04	4.22E+04	4.29E+04	1.04E+05	6.91E+04	4.94E+04	0.51	5.17E-01	3.77E-02	0.67	5.53E-01	9.51E-02	5.77E+04	3.89E+04
6.02E+04	6.18E+04	6.76E+04	9.30E+04	9.63E+04	5.78E+04	0.51	3.98E-01	1.60E-02	0.67	3.83E-01	2.67E-02	7.36E+04	4.96E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
568908031	Prolargin	3	NSFNISNLLV/LHLSHNK	Deamidated(1)Deamidated(4)	5.52	4	488.5
7242187	Legumain	2	SHTNTSHVMQYGNK	Deamidated(4)Deamidated(13)Oxidation(9)	2.83	2	811.3
6857783	low affinity immunoglobulin gamma Fc region receptor II-	3	ANHSHSGDYICK	Carbamidomethyl(11)Deamidated(2)	3.18	2	720.3
10946680	Fibromodulin	3	LSHNSLTNNGLATNTFNSSSLELD LSYNQLQK	Deamidated(4)Deamidated(8)Deamidated(17)	8.47	3	1213.6
124494256	Pro-low-density lipoprotein receptor-related protein 1	22	TCVSNCTASQFVCK	Carbamidomethyl(2)Carbamidomethyl(6)Carbamidomethyl(13)Deamidated(5)	3.53	2	831.9
568915418	Prolyl endopeptidase FAP	4	SVNATDYGLSPDR	Deamidated(3)	3.56	2	698.3
568938103	Procollagen-lysine,2-oxoglutarate 5-dioxygenase 3	2	EQYIHENYSR	Deamidated(7)	2.67	2	670.3
357588455	Extracellular sulfatase Sulf-2	3	HGSDYSTDYLTDLITNDSVSFFR	Deamidated(16)	6.19	3	885.4
226246610	Alpha-mannosidase 2	3	GSPGNASQGSIHHLHSPQLALQADP R	Deamidated(5)	5.81	3	847.1
31543108	Lysosome-associated membrane glycoprotein 2	4	LNNSQIK	Deamidated(2)	2.45	2	409.2
254588077	Multimerin-1	3	ISNLTILLEMEK	Deamidated(3)Oxidation(10)	3.9	2	710.9
85719301	carcinoembryonic antigen-related cell adhesion molecule 1	4	GNTTAIDKEIAR	Deamidated(2)	2.72	2	645.3
755470160	Complement C4-B	2	ALNVTLSSMGR	Deamidated(3)Oxidation(9)	2.78	2	583.3
568942448	Nuclear pore membrane glycoprotein 210	3	GATNNTCIIR	Carbamidomethyl(7)Deamidated(4)	2.44	2	560.8
568920740	Mast cell carboxypeptidase A	1	NQNSTCIGTDLNR	Carbamidomethyl(6)Deamidated(3)	3.69	2	747.3
755522163	Integrin alpha-M	8	DKVTFINTTR	Deamidated(7)	2.88	2	598.3
19525731	GDP-fucose protein O-fucosyltransferase 2	1	SQHLNSTDAADK	Deamidated(5)	3.79	2	644.3
111120329	Collagen alpha-2(I) chain	1	ASQNITYHCK	Carbamidomethyl(9)Deamidated(4)	2.57	2	611.8
9055226	Platelet glycoprotein IX	1	QLLLANNSLR	Deamidated(6)	3.08	2	571.8
126723006	lipoprotein lipase, partial	1	TPEDTAEDTCHLIPGLADSVSNCHF NHSSK	Carbamidomethyl(10)Carbamidomethyl(23)Deamidated(22)Deamidated(26)	7.58	5	668.9
153792543	ATP-binding cassette sub-family A member 9	2	SMNELDLNYSIDAVR	Deamidated(8)Oxidation(2)	4.47	2	878.9
568967005	Receptor-type tyrosine-protein phosphatase beta	1	SFPVYINGSTVPSPVK	Deamidated(7)	4.28	2	846.9
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	YHYNGTFEDGK	Deamidated(4)	2.98	2	687.8

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1951.0	49.7	19	3.45E+04	9.19E+04	1.95E+05	5.92E+04	8.80E+04	7.39E+04	2.59E+04	6.12E+04	1.01E+04	6.01E+03	3.48E+04
1621.7	16.2	16	2.02E+02	1.79E+05	6.32E+05	3.27E+04	3.14E+02	0.00E+00	2.89E+02	3.90E+05	2.04E+05	9.77E+04	2.73E+05
1439.6	16.7	1	0.00E+00	2.14E+04	4.46E+04	0.00E+00	6.35E+02	0.00E+00	1.53E+02	2.22E+04	1.16E+04	2.89E+03	4.86E+03
3638.8	58.2	55	5.42E+04	1.43E+05	4.90E+05	8.27E+04	3.13E+05	2.55E+05	3.52E+03	1.37E+05	1.97E+04	1.13E+04	1.64E+05
1662.7	30.8	6	7.31E+04	8.77E+04	1.26E+05	5.80E+04	1.59E+05	1.60E+05	1.32E+05	5.37E+04	7.56E+04	2.54E+04	5.38E+04
1395.6	32.3	17	1.85E+05	1.74E+05	4.30E+05	9.68E+04	2.37E+05	2.50E+05	1.40E+05	1.50E+05	9.80E+04	5.15E+04	1.06E+05
1339.6	22.6	14	2.66E+05	3.34E+05	3.32E+05	4.37E+02	5.74E+05	5.29E+05	3.41E+05	2.76E+05	1.08E+05	7.14E+04	1.30E+05
2654.2	64.8	17	8.54E+04	1.00E+05	2.72E+05	6.56E+04	2.85E+05	2.88E+05	1.80E+04	1.82E+05	8.61E+04	3.78E+04	8.44E+04
2539.3	34.1	15	2.04E+05	2.74E+05	3.59E+05	1.45E+05	3.78E+05	2.97E+05	1.32E+05	2.25E+05	9.92E+04	8.69E+04	1.13E+05
817.4	20.0	1	1.20E+06	1.97E+04	2.26E+04	0.00E+00	1.53E+06	1.90E+06	9.52E+05	9.62E+03	1.88E+04	3.49E+03	2.38E+04
1420.8	49.5	20	9.30E+04	4.58E+05	3.23E+05	1.50E+05	3.67E+05	3.23E+05	6.90E+04	2.60E+05	1.55E+05	6.89E+04	1.18E+05
1289.7	23.4	4	1.30E+05	9.37E+04	1.66E+05	0.00E+00	2.58E+05	1.94E+05	8.04E+04	8.23E+04	5.89E+04	4.89E+04	5.64E+04
1165.6	32.3	13	6.29E+05	3.23E+05	6.78E+05	8.23E+05	1.05E+06	1.44E+06	2.54E+05	5.10E+05	4.26E+05	3.00E+05	4.46E+05
1120.5	24.6	4	4.66E+04	3.83E+04	7.04E+04	7.69E+02	1.07E+05	7.55E+04	4.72E+04	4.75E+04	1.63E+04	1.48E+04	2.62E+04
1493.7	27.2	16	1.82E+05	6.16E+04	1.21E+05	6.62E+04	2.75E+05	1.94E+05	1.83E+05	3.56E+05	4.33E+04	4.46E+04	1.20E+05
1195.6	29.5	14	5.50E+05	8.02E+05	7.52E+05	4.10E+05	7.64E+05	6.36E+05	4.87E+05	4.12E+05	3.70E+05	1.39E+05	2.98E+05
1287.6	15.7	3	1.27E+05	1.04E+05	1.74E+05	0.00E+00	3.08E+05	2.14E+01	2.19E+05	1.28E+05	5.80E+04	2.11E+04	6.99E+04
1222.6	17.1	6	3.12E+05	2.23E+05	6.17E+05	3.31E+03	9.17E+05	2.61E+04	3.59E+05	2.21E+05	5.41E+04	1.33E+05	4.37E+04
1142.7	39.1	11	9.63E+04	3.30E+05	1.93E+05	8.03E+04	2.15E+05	2.01E+05	5.91E+04	1.29E+05	9.11E+04	4.66E+04	6.46E+04
3340.4	38.9	22	3.99E+04	4.57E+04	1.84E+05	3.72E+04	1.88E+05	1.14E+05	5.92E+04	4.16E+04	1.91E+04	3.17E+04	6.27E+04
1756.8	46.1	2	2.37E+05	2.32E+05	3.06E+05	1.23E+05	2.73E+05	2.28E+05	5.31E+04	2.10E+05	6.67E+04	5.25E+04	8.38E+04
1692.9	47.4	1	6.59E+04	1.32E+05	1.43E+05	4.42E+04	1.50E+05	1.72E+05	6.40E+04	9.86E+04	5.63E+04	3.32E+04	4.59E+04
1374.6	31.7	14	6.05E+05	1.11E+06	6.67E+05	6.81E+03	5.96E+05	4.80E+05	5.42E+05	3.18E+05	2.18E+05	4.68E+04	1.76E+05

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.27E+04	2.37E+04	1.41E+04	6.84E+04	6.31E+04	6.96E+04	0.53	7.66E-01	1.26E-01	0.67	8.62E-01	2.52E-01	3.92E+04	2.63E+04
6.70E+04	1.50E+05	3.69E+03	0.00E+00	1.53E+05	3.38E+02	0.58	1.42E+00	4.31E-01	0.67	1.52E+00	5.10E-01	1.06E+05	7.09E+04
8.27E+03	1.57E+04	0.00E+00	0.00E+00	1.99E+04	0.00E+00	0.58	1.49E+00	4.37E-01	0.67	1.58E+00	5.14E-01	7.23E+03	4.84E+03
3.08E+04	1.56E+05	1.85E+04	3.23E+04	7.37E+04	1.78E+05	0.50	9.07E-01	1.83E-01	0.67	1.15E+00	3.65E-01	8.93E+04	5.97E+04
3.12E+04	5.41E+04	4.54E+04	7.57E+04	6.08E+04	8.25E+04	0.52	4.05E-01	8.74E-03	0.67	3.75E-01	1.53E-02	5.85E+04	3.90E+04
8.23E+04	9.94E+04	7.39E+04	1.24E+05	1.15E+05	1.45E+05	0.51	4.21E-01	2.45E-02	0.66	4.07E-01	4.83E-02	1.11E+05	7.32E+04
1.12E+05	1.72E+05	1.23E+05	2.31E+05	2.02E+05	1.99E+05	0.51	4.74E-01	3.77E-02	0.66	4.73E-01	6.79E-02	1.72E+05	1.13E+05
5.30E+04	5.80E+04	7.65E+04	1.10E+05	1.26E+05	8.19E+04	0.51	5.42E-01	6.90E-02	0.65	5.51E-01	1.25E-01	8.72E+04	5.71E+04
1.02E+05	8.25E+04	6.40E+04	1.55E+05	1.96E+05	1.53E+05	0.51	4.06E-01	8.98E-03	0.65	3.83E-01	1.77E-02	1.33E+05	8.70E+04
1.53E+04	8.89E+05	8.75E+04	8.33E+04	1.18E+06	6.79E+04	0.47	1.31E+00	2.92E-01	0.65	1.80E+00	5.28E-01	3.17E+05	2.07E+05
2.78E+05	4.28E+04	1.09E+05	1.44E+05	9.65E+04	1.02E+05	0.49	5.60E-01	3.15E-02	0.65	8.14E-01	1.70E-01	1.43E+05	9.30E+04
6.63E+04	4.32E+04	5.54E+04	7.96E+04	5.83E+04	3.54E+04	0.47	4.25E-01	4.30E-02	0.64	4.96E-01	7.20E-02	6.58E+04	4.22E+04
4.66E+05	1.90E+05	2.04E+05	3.53E+05	1.81E+05	4.08E+05	0.47	4.31E-01	2.13E-02	0.64	5.32E-01	5.12E-02	3.82E+05	2.44E+05
1.63E+04	2.57E+04	1.90E+04	2.74E+04	3.03E+04	3.19E+04	0.48	4.33E-01	4.02E-02	0.64	4.12E-01	6.18E-02	2.77E+04	1.76E+04
3.46E+04	9.68E+04	8.28E+04	6.43E+04	9.89E+04	1.19E+05	0.50	5.14E-01	4.98E-02	0.63	6.80E-01	1.89E-01	9.59E+04	6.06E+04
3.04E+05	2.39E+05	2.25E+05	3.87E+05	3.22E+05	3.59E+05	0.49	2.83E-01	6.04E-04	0.63	2.92E-01	2.12E-03	3.33E+05	2.10E+05
4.98E+04	5.86E+04	4.76E+04	1.02E+05	6.71E+04	7.04E+04	0.49	5.85E-01	9.97E-02	0.63	6.11E-01	1.45E-01	7.05E+04	4.45E+04
1.85E+05	1.38E+05	1.16E+05	1.20E+05	1.44E+05	1.96E+05	0.44	5.91E-01	1.32E-01	0.63	7.63E-01	2.31E-01	1.63E+05	1.03E+05
1.84E+05	3.63E+04	6.30E+04	7.98E+04	6.68E+04	4.04E+04	0.47	5.68E-01	2.93E-02	0.63	8.47E-01	1.69E-01	9.05E+04	5.70E+04
4.26E+04	1.97E+04	2.21E+04	2.72E+04	3.66E+04	4.41E+04	0.44	5.29E-01	7.39E-02	0.63	6.62E-01	1.50E-01	4.30E+04	2.70E+04
7.40E+04	7.19E+04	1.06E+05	1.23E+05	1.06E+05	1.24E+05	0.48	3.62E-01	1.07E-02	0.63	3.86E-01	3.17E-02	1.09E+05	6.85E+04
4.82E+04	5.89E+04	5.52E+04	2.80E+04	6.67E+04	5.42E+04	0.47	3.45E-01	9.00E-03	0.62	4.03E-01	2.20E-02	5.91E+04	3.68E+04
1.54E+05	3.20E+05	1.84E+05	3.74E+05	3.64E+05	4.15E+05	0.50	5.72E-01	5.03E-02	0.62	6.57E-01	1.25E-01	2.93E+05	1.82E+05

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
45504394	Integrin beta-1	7	LRNPCTSEQNCTSPFSYK	Carbamidomethyl(5)Carbamidomethyl(11)Deamidated(10)	6.51	3	730.7
124494256	Prolow-density lipoprotein receptor-related protein 1	22	LTSCATNASMCGDEAR	Carbamidomethyl(4)Carbamidomethyl(11)Deamidated(7)Oxidation(10)	2.68	2	880.8
6679166	Mimecan	1	VIHLQFNSSILTDITFCKANDTR	Carbamidomethyl(18)Deamidated(21)	6.21	4	696.6
145966911	Transmembrane emp24 domain-containing protein 9	1	FTFTSHTPGEHQICLHSNSTK	Carbamidomethyl(14)Deamidated(18)	7.72	4	608.3
154240724	Ectonucleotide pyrophosphatase/phosphodiesterase family member 3	1	LNLSEGEVAATVK	Deamidated(2)	3.44	2	666.4
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	7	YHYNCSLLDGTR	Carbamidomethyl(5)Deamidated(4)	3.42	2	750.3
545477648	CD63 antigen	1	DRVPDSCCINITVGCGNDFK	Carbamidomethyl(7)Carbamidomethyl(8)Carbamidomethyl(15)Deamidated(10)	4.4	3	776.7
339895744	Collagen alpha-3(VI) chain	5	VAVVQQSTYESVDNASVPPVKVEFSLTDYGAK	Deamidated(14)	4.01	3	1143.6
269315863	Collagen alpha-5(VI)	7	EQESMMNLTIHLVK	Deamidated(7)Oxidation(5)Oxidation(6)	3.41	2	853.4
124487415	Latent-transforming growth factor beta-binding protein 3	1	DSCQQGSNMTLIGENGHSTDTLTSRSGFR	Carbamidomethyl(3)Deamidated(8)Deamidated(15)Oxidation(9)	5.65	3	996.8
124494256	Prolow-density lipoprotein receptor-related protein 1	22	GCKDNATDSVPLR	Carbamidomethyl(2)Deamidated(5)	3.94	3	478.6
357588455	Extracellular sulfatase Sulf-2	3	TFAVYLNSTGYR	Deamidated(7)	2.66	2	696.8
568988705	Transmembrane and TPR repeat-containing protein 4	1	NLADQGNQTAAIK	Deamidated(7)	2.48	2	672.8
755525407	Fibrinogen-like protein 1	1	IDLTDFEKNSSFAQYQSFK	Deamidated(9)	6.17	3	757.0
6677905	Golgi apparatus protein 1	3	DIVGNL TELESEDIQIEALLMR	Deamidated(5)Oxidation(21)	3.15	3	840.1
228008326	Probable carboxypeptidase X1	2	SRNSTGMDIVFPANSDAETPVLNLLPEPQVAR	Deamidated(3)Oxidation(7)	3.76	3	1152.6
269315863	Collagen alpha-5(VI)	7	YQEIIIELESSLNK	Deamidated(12)	3.51	2	783.9
568989825	Lysyl oxidase-like protein 2	3	DPVKNATCENGQPAVVSCVPSQIFSPDGPSR	Carbamidomethyl(8)Carbamidomethyl(18)Deamidated(5)Deamidated(10)	5.54	3	1105.8
224967060	Matrilin-4	1	SLDVGLNATR	Deamidated(7)	2.61	2	523.8
228008326	Probable carboxypeptidase X1	2	QVNEQCPNITR	Carbamidomethyl(6)Deamidated(8)	2.85	2	680.3
124494256	Prolow-density lipoprotein receptor-related protein 1	22	QTGDVTCNCTDGR	Carbamidomethyl(7)Carbamidomethyl(9)Deamidated(8)	3.33	2	742.8
568987063	stabilin-1	7	GCADYCNQTITK	Carbamidomethyl(2)Carbamidomethyl(6)Deamidated(7)	3.6	2	716.3

14 Supplemental Table S2

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
2190.0	30.2	19	4.59E+05	3.78E+05	8.67E+05	1.36E+05	9.61E+05	7.72E+05	3.16E+05	2.88E+05	1.78E+05	1.30E+05	2.25E+05
1760.7	20.1	11	1.44E+05	1.34E+05	2.39E+05	0.00E+00	3.36E+05	2.70E+05	2.07E+05	9.79E+04	4.36E+04	2.47E+04	8.82E+04
2783.3	47.4	43	5.12E+05	5.00E+05	1.25E+06	4.09E+05	1.64E+06	1.61E+06	1.27E+05	8.19E+05	1.33E+05	1.39E+05	5.25E+05
2430.1	28.9	67	2.04E+06	2.07E+06	3.08E+06	7.71E+05	3.43E+06	2.99E+06	1.07E+06	1.49E+06	4.63E+05	4.66E+05	1.32E+06
1331.7	37.9	4	4.71E+05	5.83E+05	7.33E+05	2.70E+05	4.99E+05	5.16E+05	3.53E+05	4.82E+05	2.12E+05	1.05E+05	1.57E+05
1499.7	33.0	16	4.15E+05	6.86E+05	5.70E+05	1.53E+05	5.21E+05	5.30E+05	3.76E+05	2.20E+05	1.54E+05	3.20E+04	1.56E+05
2328.0	40.3	14	1.79E+05	2.27E+05	3.81E+05	6.14E+04	4.91E+05	4.82E+05	1.12E+05	1.90E+05	7.71E+04	4.39E+04	1.83E+05
3428.7	51.0	10	1.58E+05	5.81E+04	2.88E+05	1.75E+05	4.90E+05	4.40E+05	3.20E+03	1.35E+05	5.66E+04	5.78E+04	3.11E+04
1705.8	34.5	15	5.47E+05	1.06E+05	4.18E+05	2.10E+05	4.85E+05	5.17E+05	1.45E+05	3.71E+05	9.07E+04	1.19E+05	3.36E+05
2988.3	38.5	14	1.77E+05	2.36E+05	3.65E+05	7.81E+04	3.71E+05	3.80E+05	1.47E+05	1.70E+05	5.15E+04	7.87E+04	1.32E+05
1433.7	23.8	12	1.34E+05	8.74E+04	1.91E+05	2.13E+03	2.74E+05	2.50E+05	1.81E+05	1.12E+05	4.62E+04	2.80E+04	7.22E+04
1392.7	43.3	4	6.11E+04	5.28E+04	1.64E+05	4.40E+04	2.24E+05	2.40E+05	2.25E+04	1.29E+05	5.78E+04	2.54E+04	9.54E+04
1344.7	24.1	3	9.86E+04	1.17E+05	1.21E+05	7.21E+04	1.84E+05	1.64E+05	8.46E+04	1.18E+05	3.81E+04	3.23E+04	5.71E+04
2269.1	51.7	14	2.99E+05	8.73E+05	7.91E+05	7.88E+05	6.38E+05	6.89E+05	1.94E+05	5.68E+05	3.68E+05	2.49E+05	2.66E+05
2518.3	78.8	7	1.12E+04	7.58E+04	2.09E+05	1.04E+04	5.24E+04	1.35E+03	4.43E+03	5.42E+02	1.72E+04	1.07E+04	4.67E+04
3455.7	57.3	10	8.90E+04	1.02E+05	2.25E+05	8.20E+04	1.91E+05	1.68E+05	3.95E+04	1.35E+05	6.93E+04	3.44E+04	5.62E+04
1566.8	46.9	3	1.85E+05	5.52E+04	1.44E+05	7.81E+04	1.82E+05	1.75E+05	3.55E+04	1.37E+05	2.79E+04	3.75E+04	5.65E+04
3315.5	47.3	8	1.91E+05	3.97E+05	4.77E+05	1.65E+05	4.46E+05	4.87E+05	1.06E+05	1.34E+05	9.24E+04	8.08E+04	1.67E+05
1046.5	34.1	2	1.50E+05	1.48E+05	3.13E+05	1.39E+05	4.20E+05	3.64E+05	9.84E+04	2.20E+05	6.57E+04	6.48E+04	1.21E+05
1359.6	22.8	1	2.65E+04	3.37E+04	8.26E+04	1.55E+05	1.18E+05	8.78E+04	5.28E+04	6.63E+04	2.58E+04	2.10E+04	3.01E+04
1484.6	18.0	9	6.18E+04	0.00E+00	3.61E+03	0.00E+00	1.76E+05	2.35E+05	1.04E+05	2.03E+03	0.00E+00	0.00E+00	4.68E+04
1431.6	23.6	3	5.58E+04	4.61E+04	7.32E+04	0.00E+00	1.10E+05	1.15E+05	7.98E+04	3.63E+04	1.67E+04	1.58E+04	3.15E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
1.46E+05	2.35E+05	2.05E+05	2.38E+05	3.87E+05	2.19E+05	0.46	4.52E-01	3.53E-02	0.62	4.44E-01	4.97E-02	2.65E+05	1.64E+05
4.29E+04	1.01E+05	5.09E+04	9.65E+04	9.09E+04	1.05E+05	0.46	4.94E-01	4.35E-02	0.61	5.35E-01	6.90E-02	8.88E+04	5.45E+04
1.58E+05	3.89E+05	1.50E+05	5.28E+05	5.21E+05	4.72E+05	0.46	5.84E-01	7.22E-02	0.61	6.55E-01	1.30E-01	4.21E+05	2.58E+05
5.27E+05	8.07E+05	6.65E+05	1.02E+06	9.85E+05	1.32E+06	0.46	4.26E-01	1.98E-02	0.61	4.36E-01	3.32E-02	1.06E+06	6.49E+05
1.17E+05	1.38E+05	1.59E+05	3.01E+05	5.23E+05	3.17E+05	0.50	4.88E-01	6.90E-03	0.61	4.94E-01	2.00E-02	2.65E+05	1.61E+05
9.74E+04	2.68E+05	1.49E+05	2.00E+05	2.77E+05	3.57E+05	0.48	4.90E-01	1.43E-02	0.60	5.53E-01	4.32E-02	2.27E+05	1.38E+05
5.90E+04	1.36E+05	7.25E+04	8.76E+04	1.42E+05	1.68E+05	0.46	5.25E-01	4.70E-02	0.60	5.72E-01	7.35E-02	1.34E+05	8.10E+04
6.83E+04	3.02E+04	2.99E+04	2.67E+05	1.92E+05	4.66E+04	0.45	8.30E-01	1.17E-01	0.60	9.59E-01	2.10E-01	1.06E+05	6.42E+04
5.06E+04	1.13E+05	6.52E+04	6.43E+04	1.09E+05	3.30E+05	0.46	6.29E-01	3.55E-02	0.60	7.46E-01	1.07E-01	1.79E+05	1.08E+05
7.41E+04	1.16E+05	5.63E+04	7.61E+04	1.35E+05	1.11E+05	0.44	3.91E-01	2.05E-02	0.60	4.33E-01	3.72E-02	1.21E+05	7.26E+04
3.84E+04	6.86E+04	4.37E+04	7.28E+04	6.47E+04	1.24E+05	0.45	4.97E-01	3.53E-02	0.59	5.09E-01	4.92E-02	7.81E+04	4.64E+04
2.98E+04	3.47E+04	5.46E+04	5.42E+04	5.87E+04	4.66E+04	0.45	5.35E-01	6.05E-02	0.59	6.03E-01	9.76E-02	6.22E+04	3.67E+04
3.45E+04	4.46E+04	3.94E+04	6.42E+04	7.74E+04	4.76E+04	0.45	3.21E-01	3.12E-03	0.58	2.94E-01	4.12E-03	6.25E+04	3.65E+04
3.14E+05	1.84E+05	2.05E+05	3.11E+05	3.39E+05	1.96E+05	0.45	2.88E-01	3.69E-03	0.58	3.78E-01	1.43E-02	3.37E+05	1.96E+05
1.53E+04	2.06E+04	2.07E+04	0.00E+00	4.58E+02	2.72E+04	0.42	1.02E+00	3.12E-01	0.58	1.33E+00	4.42E-01	2.34E+04	1.35E+04
5.91E+04	5.54E+04	3.00E+04	8.29E+04	7.25E+04	4.45E+04	0.44	3.71E-01	1.07E-02	0.58	4.08E-01	1.98E-02	7.01E+04	4.04E+04
2.50E+04	6.04E+04	3.43E+04	3.61E+04	5.45E+04	8.91E+04	0.43	4.26E-01	1.81E-02	0.57	4.90E-01	4.52E-02	6.33E+04	3.62E+04
1.66E+05	1.25E+05	5.82E+04	8.94E+04	8.01E+04	1.48E+05	0.41	4.06E-01	2.10E-02	0.57	5.30E-01	4.59E-02	1.53E+05	8.70E+04
3.50E+04	1.51E+05	3.59E+04	8.42E+04	1.18E+05	1.11E+05	0.42	4.46E-01	1.92E-02	0.56	5.18E-01	3.07E-02	1.18E+05	6.63E+04
2.30E+04	2.72E+04	3.03E+04	4.22E+04	3.42E+04	2.88E+04	0.41	3.42E-01	2.00E-02	0.56	3.51E-01	2.67E-02	3.95E+04	2.21E+04
5.94E+03	2.22E+03	3.21E+04	3.09E+04	4.23E+04	4.46E+04	0.40	8.50E-01	2.31E-01	0.55	1.16E+00	3.66E-01	3.21E+04	1.78E+04
2.08E+04	2.10E+04	1.88E+04	2.40E+04	2.75E+04	3.33E+04	0.41	3.75E-01	2.82E-02	0.55	3.80E-01	3.62E-02	3.23E+04	1.79E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
124494256	Prolow-density lipoprotein receptor-related protein 1	22	FGTCSQLCNNTK	Carbamidomethyl(4)Carbamidomethyl(8)Deamidated(9)	4.01	2	715.8
568988013	Olfactomedin-4	1	INLTTNVVDVNRPLPLAAYNNR	Deamidated(2)	3.57	3	823.4
115511022	Vwf protein	1	VPLHCTNGSVVYHEVINAMQCR	Carbamidomethyl(5)Carbamidomethyl(21)Deamidated(7)Oxidation(19)	4.99	4	651.1
568972025	Myeloperoxidase	1	ALMPFDSLHDDPCLLTNR	Carbamidomethyl(13)Deamidated(17)Oxidation(3)	4.57	3	711.3
568975598	Complement C1q tumor necrosis factor-related protein 2	1	ILMNEGGHYNASSGK	Deamidated(10)Oxidation(3)	3.94	2	797.9
224967062	Macrophage mannose receptor 1	1	TSYCNESFYFLCK	Carbamidomethyl(4)Carbamidomethyl(12)Deamidated(5)	3.27	2	860.4
568926396	Tenascin	12	TPMLSTDVSTAREPEIGNLVSDVTPK	Deamidated(20)Oxidation(3)	7.69	3	963.5
568989825	Lysyl oxidase-like protein 2	3	FSMNCTGTEAHISSCK	Carbamidomethyl(5)Carbamidomethyl(15)Deamidated(4)Oxidation(3)	4.81	3	616.3
12963767	KDEL motif-containing protein 1	1	EMNCSETISQIQK	Carbamidomethyl(4)Deamidated(3)Oxidation(2)	2.92	2	792.8
165905611	latent transforming growth factor beta binding protein 4	2	VNGSCVDVDECATGGR	Carbamidomethyl(5)Carbamidomethyl(11)Deamidated(2)	2.72	2	848.8
225543173	Cartilage-associated protein	2	NCSAATPAPAPAGPASHAELR	Carbamidomethyl(2)Deamidated(1)	5	3	683.0
568979644	Fibulin-5	1	NHTCTSLQTCYNLQGGFK	Carbamidomethyl(4)Carbamidomethyl(10)Deamidated(1)	3.6	3	710.7
269315863	Collagen alpha-5(VI)	7	RFNETR	Deamidated(3)	2.41	2	412.2
85861262	Netrin receptor UNC5B	1	LSDTANYTCVAK	Carbamidomethyl(9)Deamidated(6)	2.81	2	672.3
568923623	Translocon-associated protein subunit beta	2	IAPASNVSHTVVLRPLK	Deamidated(6)	4.92	2	902.0
46849812	Fibronectin	10	VFAVHQGRESNPLTAQQTTKLDAP TNLQFVNETDR	Deamidated(31)	7.94	4	982.5
45504394	Integrin beta-1	7	KDTCAQECSHFNLTK	Carbamidomethyl(4)Carbamidomethyl(8)Deamidated(12)	5.9	3	613.9
568926396	Tenascin	12	GPNCSEPDPCGNCNLR	Carbamidomethyl(4)Carbamidomethyl(9)Carbamidomethyl(13)Deamidated(3)	4.01	2	924.4
755522163	Integrin alpha-M	8	TPVLNCSVAVCK	Carbamidomethyl(6)Carbamidomethyl(11)Deamidated(5)	3.61	2	674.8
269315863	Collagen alpha-5(VI)	7	SNDSVLEPANR	Deamidated(2)	3.11	2	601.8
166064058	Slit homolog 2 protein	2	DLEVLTLNNNNITR	Deamidated(11)	3.42	2	815.4

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1430.6	25.4	15	2.27E+05	2.09E+05	2.99E+05	2.25E+03	4.66E+05	4.08E+05	2.64E+05	1.60E+05	7.31E+04	4.41E+04	1.11E+05
2468.3	48.4	2	1.98E+04	9.27E+04	8.52E+04	1.66E+05	8.69E+04	5.11E+04	1.27E+04	1.24E+05	1.46E+05	2.75E+04	6.48E+04
2601.2	35.4	6	4.92E+04	1.25E+05	1.26E+05	2.34E+04	1.97E+05	1.52E+05	4.87E+04	6.73E+04	3.59E+04	1.55E+04	4.73E+04
2132.0	46.0	16	1.61E+05	3.67E+05	3.93E+05	4.68E+05	4.78E+05	5.85E+05	1.20E+05	4.56E+05	7.55E+05	1.86E+05	2.51E+05
1594.7	20.3	4	4.48E+04	1.94E+04	3.40E+04	0.00E+00	6.44E+04	4.19E+04	3.40E+04	2.71E+04	7.85E+03	6.76E+03	1.27E+04
1719.7	47.9	11	2.44E+05	1.84E+05	2.70E+05	9.70E+04	2.93E+05	2.75E+05	1.72E+05	1.28E+05	8.70E+04	3.70E+04	9.53E+04
2888.4	43.9	18	6.59E+05	3.15E+05	1.25E+06	6.95E+05	1.01E+06	9.95E+05	5.66E+04	4.65E+05	2.25E+05	4.03E+05	1.29E+05
1846.7	22.3	8	1.02E+05	1.39E+05	1.90E+05	0.00E+00	2.70E+05	2.66E+05	9.87E+04	6.93E+04	2.47E+04	2.33E+04	5.50E+04
1584.7	26.7	9	7.07E+04	9.30E+04	1.45E+05	5.28E+04	1.97E+05	1.75E+05	1.26E+05	8.12E+04	3.75E+04	1.76E+04	5.05E+04
1696.7	26.2	13	9.06E+04	8.91E+04	1.45E+05	2.24E+04	2.23E+05	1.88E+05	9.10E+04	6.71E+04	1.93E+04	3.05E+04	4.51E+04
2047.0	27.0	3	5.25E+04	6.34E+04	1.01E+05	2.94E+04	1.55E+05	1.24E+05	5.27E+04	6.07E+04	1.64E+04	1.27E+04	3.05E+04
2129.9	36.3	8	5.46E+04	8.25E+04	1.26E+05	2.15E+04	1.52E+05	1.68E+05	5.54E+04	6.35E+04	7.44E+03	1.71E+04	5.00E+04
823.4	16.1	1	1.49E+05	4.22E+04	8.50E+04	1.16E+02	1.76E+05	2.40E+02	6.58E+04	9.51E+04	1.40E+04	1.64E+04	3.08E+04
1343.6	27.8	11	1.14E+05	1.05E+05	1.06E+05	2.70E+05	1.39E+05	4.04E+05	1.00E+05	9.14E+04	4.86E+04	4.19E+04	6.51E+04
1803.0	33.0	110	1.08E+05	1.65E+05	2.15E+05	6.16E+04	3.20E+05	2.57E+05	1.20E+05	1.40E+05	5.58E+04	5.26E+04	5.62E+04
3927.0	40.0	7	1.23E+05	2.08E+05	3.10E+05	1.12E+05	3.04E+05	3.56E+05	5.99E+04	1.66E+05	6.02E+04	3.79E+04	7.96E+04
1839.8	23.5	18	4.08E+05	3.31E+05	7.69E+05	1.07E+03	1.02E+06	9.65E+05	6.00E+05	3.05E+05	1.04E+05	7.70E+04	2.95E+05
1847.7	23.5	27	2.08E+05	1.66E+05	4.96E+05	0.00E+00	7.48E+05	7.71E+05	2.13E+05	2.46E+05	4.82E+04	7.30E+04	1.95E+05
1348.7	32.7	3	1.50E+05	2.56E+05	2.79E+05	5.35E+04	2.59E+05	2.65E+05	1.88E+05	1.23E+05	6.88E+04	2.65E+04	1.01E+05
1202.6	26.2	6	2.99E+05	4.26E+04	1.60E+05	5.46E+04	2.28E+05	1.96E+05	9.18E+04	1.31E+05	2.51E+04	3.96E+04	4.93E+04
1629.8	49.0	3	1.51E+05	2.34E+05	1.71E+05	1.18E+05	1.92E+05	2.26E+05	6.33E+04	1.66E+05	3.49E+04	4.41E+04	4.29E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
6.04E+04	1.15E+05	6.76E+04	1.05E+05	1.19E+05	1.59E+05	0.42	4.24E-01	2.50E-02	0.55	4.28E-01	2.72E-02	1.29E+05	7.10E+04
9.60E+04	1.56E+04	1.74E+04	4.89E+04	2.39E+04	2.01E+04	0.45	6.03E-01	3.57E-02	0.55	8.87E-01	1.67E-01	5.61E+04	3.07E+04
4.54E+04	4.21E+04	2.79E+04	2.80E+04	4.68E+04	4.44E+04	0.41	3.96E-01	2.71E-02	0.55	4.59E-01	3.53E-02	5.08E+04	2.78E+04
3.71E+05	1.15E+05	1.52E+05	1.78E+05	1.04E+05	1.11E+05	0.44	4.19E-01	7.19E-03	0.54	7.29E-01	1.22E-01	2.69E+05	1.45E+05
7.76E+03	1.50E+04	1.10E+04	1.13E+04	1.61E+04	1.68E+04	0.40	3.81E-01	2.43E-02	0.54	4.01E-01	3.06E-02	1.67E+04	8.97E+03
6.46E+04	8.97E+04	6.75E+04	9.40E+04	9.54E+04	8.88E+04	0.41	2.74E-01	2.18E-03	0.54	2.55E-01	8.94E-04	1.09E+05	5.84E+04
3.46E+05	1.83E+05	8.19E+04	2.85E+05	3.67E+05	1.01E+05	0.38	4.43E-01	1.96E-02	0.54	6.14E-01	4.47E-02	3.45E+05	1.85E+05
4.70E+04	5.23E+04	4.08E+04	4.43E+04	5.01E+04	8.30E+04	0.38	4.19E-01	4.04E-02	0.53	4.69E-01	5.60E-02	6.93E+04	3.66E+04
2.94E+04	4.80E+04	3.90E+04	4.88E+04	5.14E+04	5.97E+04	0.40	3.27E-01	7.23E-03	0.53	3.13E-01	4.31E-03	5.99E+04	3.15E+04
2.80E+04	3.98E+04	3.27E+04	3.33E+04	5.78E+04	4.78E+04	0.38	3.51E-01	2.38E-02	0.52	3.57E-01	2.73E-02	5.60E+04	2.92E+04
1.63E+04	2.82E+04	2.02E+04	3.63E+04	5.10E+04	3.37E+04	0.39	4.13E-01	1.93E-02	0.52	4.09E-01	1.85E-02	3.96E+04	2.06E+04
1.66E+04	4.26E+04	1.56E+04	3.39E+04	2.97E+04	4.22E+04	0.38	4.30E-01	2.86E-02	0.52	5.13E-01	4.64E-02	4.37E+04	2.27E+04
1.33E+04	1.79E+04	1.91E+04	1.56E+03	3.27E+04	9.79E+04	0.41	7.98E-01	1.08E-01	0.52	8.91E-01	1.58E-01	3.93E+04	2.04E+04
2.93E+04	2.97E+04	5.92E+04	7.10E+04	5.32E+04	1.25E+05	0.39	4.84E-01	3.82E-02	0.52	5.23E-01	4.83E-02	8.35E+04	4.31E+04
5.61E+04	6.72E+04	3.72E+04	7.20E+04	7.86E+04	7.08E+04	0.38	2.96E-01	1.02E-02	0.52	3.00E-01	8.42E-03	8.89E+04	4.58E+04
8.78E+04	6.17E+04	4.88E+04	6.06E+04	1.12E+05	7.53E+04	0.37	3.46E-01	1.32E-02	0.50	3.91E-01	1.61E-02	1.05E+05	5.24E+04
1.30E+05	1.95E+05	1.34E+05	1.51E+05	2.32E+05	2.55E+05	0.37	4.12E-01	3.11E-02	0.50	4.58E-01	3.70E-02	2.69E+05	1.34E+05
6.18E+04	1.57E+05	5.12E+04	6.22E+04	1.71E+05	1.59E+05	0.36	5.03E-01	6.40E-02	0.50	6.01E-01	8.75E-02	1.71E+05	8.51E+04
3.03E+04	7.20E+04	4.66E+04	8.13E+04	9.58E+04	1.10E+05	0.39	3.64E-01	4.87E-03	0.49	3.76E-01	5.18E-03	1.03E+05	5.06E+04
2.64E+04	4.46E+04	3.70E+04	4.15E+04	5.24E+04	1.13E+05	0.37	4.45E-01	2.48E-02	0.49	5.09E-01	4.60E-02	7.51E+04	3.68E+04
5.97E+04	6.25E+04	6.47E+04	4.34E+04	9.36E+04	1.61E+04	0.35	3.10E-01	2.41E-03	0.48	4.08E-01	8.87E-03	8.54E+04	4.08E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
218931165	Procollagen-lysine,2-oxoglutarate 5-dioxygenase 2	1	YNCSIESPR	Carbamidomethyl(3)Deamidated(2)	2.87	2	563.7
568959025	Suppressor of tumorigenicity 14 protein homolog	1	SQFVVSSNSSK	Deamidated(8)	3.05	2	585.8
568940646	Fibulin-2	2	EGETCGAEDNDTCGVSLYK	Carbamidomethyl(5)Carbamidomethyl(13)Deamidated(10)	4.93	2	1053.4
113865977	Lactadherin	2	KFEFIQDESGGDKEFLGNLDNNSLK	Deamidated(21)	4.09	4	712.1
755498697	Fibrillin-1	5	CDSGFALDSEERNCTDIDECR	Carbamidomethyl(1)Carbamidomethyl(14)Carbamidomethyl(20)Deamidated(13)	6.01	3	850.7
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	8	CDGDFDCEDRTDEANCSVK	Carbamidomethyl(1)Carbamidomethyl(7)Carbamidomethyl(16)Deamidated(15)	4.42	3	765.3
269315863	Collagen alpha-5(VI)	7	LEGVTMFAMGIEGANNTQLEDIVSYPSR	Deamidated(16)Oxidation(6)Oxidation(9)	5.85	3	1025.8
114052444	Neutrophil elastase	1	LGTNRPSPSVLQELNVTVVVTNMCR	Carbamidomethyl(23)Deamidated(15)Oxidation(22)	5.16	3	901.5
46849812	Fibronectin	10	HEEGHMLNCTCFGQGR	Carbamidomethyl(9)Carbamidomethyl(11)Deamidated(8)Oxidation(6)	6.23	3	650.6
47059073	thrombospondin 1	1	GCSSSATNVLLTLDNNVVNGSSPAIR	Carbamidomethyl(2)Deamidated(19)	6.06	3	883.1
269315863	Collagen alpha-5(VI)	7	SSANQSEFQQQIQK	Deamidated(4)	4.08	2	812.4
568940646	Fibulin-2	2	DLDECALGTHNCSEAETCHNIQGSFR	Carbamidomethyl(5)Carbamidomethyl(12)Carbamidomethyl(18)Deamidated(11)	8.44	3	1008.1
45504394	Integrin beta-1	7	KENSSEICSNNGECVCGQCVCR	Carbamidomethyl(8)Carbamidomethyl(14)Carbamidomethyl(16)Carbamidomethyl(19)Carbamidomethyl(21)Deamidated(3)Deamidated(11)	4.33	3	883.7
568958751	Hypoxia up-regulated protein	7	FQISPQLQFSPEEVLMVLNYSR	Deamidated(20)Oxidation(17)	5.27	3	900.5
46849812	Fibronectin	10	RHEEGHMLNCTCFGQGR	Carbamidomethyl(10)Carbamidomethyl(12)Deamidated(9)Oxidation(7)	3.79	3	702.3
7305277	Matrix metalloproteinase 9	1	TSNLTDQLAEAYLYR	Deamidated(3)	4.82	2	930.5
47059073;568916267	thrombospondin 1	1	VSCPIMPCSNATVPDGECCPR	Carbamidomethyl(3)Carbamidomethyl(8)Carbamidomethyl(18)Carbamidomethyl(19)Deamidated(10)Oxidation(6)	3.34	3	808.7
145966840	Eosinophil peroxidase	1	ALLPFDNLHEDPCLLTNR	Carbamidomethyl(13)Deamidated(17)	3.34	3	713.7

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
1126.5	24.1	15	1.10E+05	1.30E+05	1.59E+05	0.00E+00	2.73E+05	2.58E+05	2.15E+05	9.08E+04	5.72E+04	1.44E+04	3.68E+04
1170.6	23.2	2	4.10E+04	2.97E+04	4.78E+04	2.95E+05	6.34E+04	2.56E+04	4.50E+04	1.61E+04	1.25E+04	1.53E+04	4.13E+04
2105.8	32.6	16	3.63E+05	6.98E+05	6.99E+05	2.12E+05	9.08E+05	8.81E+05	4.36E+05	2.86E+05	2.13E+05	1.24E+05	2.15E+05
2845.4	45.5	6	8.31E+04	2.64E+05	2.86E+05	3.16E+05	3.04E+05	2.78E+05	7.81E+04	2.75E+05	5.92E+05	7.32E+04	1.55E+05
2550.0	34.1	22	1.00E+06	5.91E+05	2.16E+06	3.27E+05	2.51E+06	2.63E+06	5.87E+05	7.18E+05	1.92E+05	3.19E+05	5.74E+05
2293.8	24.0	1	6.09E+04	3.70E+04	1.34E+05	1.84E+04	1.74E+05	1.62E+05	5.20E+04	2.76E+04	1.55E+04	2.17E+04	3.65E+04
3075.4	57.6	9	1.56E+05	3.17E+04	1.53E+05	3.74E+04	1.39E+05	1.34E+05	7.62E+03	1.29E+05	3.35E+04	3.49E+04	2.02E+04
2702.4	46.6	5	1.46E+04	8.21E+04	7.31E+04	1.36E+05	9.01E+04	7.46E+04	1.69E+04	1.05E+05	1.81E+05	1.07E+04	6.65E+04
1949.8	22.8	89	5.42E+06	6.15E+06	1.10E+07	0.00E+00	1.48E+07	1.36E+07	5.75E+06	4.39E+06	1.22E+06	1.30E+06	3.01E+06
2647.3	53.9	18	3.92E+05	6.19E+05	3.77E+05	1.31E+05	2.66E+05	2.51E+05	4.68E+04	3.01E+05	1.21E+05	5.97E+04	1.05E+05
1623.8	26.7	9	2.57E+05	4.78E+04	1.77E+05	6.88E+04	2.47E+05	1.89E+05	9.74E+04	1.42E+05	3.28E+04	4.14E+04	5.07E+04
3022.2	33.5	28	3.50E+05	6.49E+05	1.14E+06	1.01E+05	1.14E+06	1.08E+06	4.95E+05	2.97E+05	1.27E+05	7.52E+04	2.65E+05
2649.0	23.5	8	5.42E+04	6.06E+04	1.24E+05	0.00E+00	1.58E+05	1.59E+05	8.57E+04	2.74E+04	5.95E+03	3.83E+03	3.53E+04
2699.3	73.9	75	1.47E+03	9.06E+05	1.36E+06	4.03E+03	1.11E+06	8.73E+05	5.30E+03	1.03E+04	3.58E+03	1.88E+02	1.96E+03
2104.9	20.7	112	3.38E+06	2.92E+06	7.29E+06	0.00E+00	9.05E+06	8.79E+06	2.42E+06	2.66E+06	9.21E+05	6.95E+05	1.33E+05
1859.9	48.2	1	4.81E+04	8.06E+04	6.04E+04	2.02E+05	8.38E+04	4.40E+04	9.16E+03	4.30E+04	1.40E+05	0.00E+00	3.82E+04
2424.0	32.8	3	7.73E+04	1.07E+05	1.21E+05	2.09E+04	9.87E+04	1.12E+05	2.98E+04	4.20E+04	9.90E+03	1.20E+04	2.75E+04
2139.1	51.4	14	5.44E+05	3.06E+05	4.58E+05	1.77E+05	1.35E+06	1.11E+06	2.13E+05	8.32E+05	3.36E+05	3.30E+04	6.40E+04

14 Supplemental Table S2

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
2.44E+04	6.82E+04	3.00E+04	6.23E+04	7.32E+04	1.10E+05	0.36	4.53E-01	1.86E-02	0.47	4.75E-01	1.53E-02	7.95E+04	3.73E+04
1.93E+04	1.53E+04	1.68E+04	2.17E+04	1.56E+04	1.96E+04	0.32	5.79E-01	1.79E-01	0.46	7.69E-01	2.44E-01	3.36E+04	1.55E+04
1.06E+05	2.38E+05	1.13E+05	1.51E+05	2.97E+05	1.98E+05	0.35	3.15E-01	6.02E-03	0.46	3.28E-01	4.26E-03	2.90E+05	1.33E+05
2.18E+05	5.82E+04	8.57E+04	1.06E+05	7.81E+04	6.69E+04	0.38	4.07E-01	9.47E-03	0.45	6.87E-01	1.14E-01	1.81E+05	8.18E+04
1.91E+05	4.22E+05	2.13E+05	3.36E+05	5.82E+05	4.36E+05	0.32	3.86E-01	3.73E-02	0.45	4.49E-01	4.46E-02	6.31E+05	2.83E+05
1.16E+04	2.32E+04	1.60E+04	2.43E+04	2.51E+04	3.23E+04	0.32	3.69E-01	3.97E-02	0.44	4.37E-01	4.65E-02	3.97E+04	1.76E+04
1.40E+04	3.57E+04	1.20E+04	5.78E+03	3.95E+04	8.91E+04	0.34	5.22E-01	2.22E-02	0.44	6.11E-01	4.16E-02	5.19E+04	2.29E+04
6.81E+04	2.17E+04	1.55E+04	2.84E+04	2.43E+04	2.22E+04	0.37	4.89E-01	1.73E-02	0.43	7.31E-01	1.14E-01	5.67E+04	2.46E+04
2.07E+06	2.62E+06	1.27E+06	1.52E+06	2.21E+06	3.19E+06	0.31	3.40E-01	2.45E-02	0.43	3.98E-01	2.50E-02	3.72E+06	1.60E+06
1.37E+05	8.71E+04	4.36E+04	4.73E+04	8.87E+04	1.05E+05	0.30	3.04E-01	9.81E-03	0.39	4.26E-01	2.34E-02	1.65E+05	6.42E+04
1.17E+04	4.25E+04	1.62E+04	1.32E+04	5.22E+04	9.39E+04	0.29	3.68E-01	7.09E-03	0.38	4.28E-01	8.64E-03	7.72E+04	2.93E+04
1.05E+05	2.03E+05	1.10E+05	1.03E+05	1.85E+05	2.59E+05	0.27	3.20E-01	1.56E-02	0.37	3.69E-01	1.39E-02	3.22E+05	1.20E+05
1.01E+04	2.12E+04	1.33E+04	1.45E+04	3.09E+04	3.19E+04	0.27	3.72E-01	2.75E-02	0.37	4.44E-01	2.93E-02	3.93E+04	1.44E+04
0.00E+00	4.14E+02	9.74E+02	5.54E+05	5.45E+05	3.08E+03	0.29	8.88E-01	1.39E-01	0.36	1.11E+00	1.96E-01	2.45E+05	8.92E+04
1.34E+06	1.58E+06	7.73E+05	8.47E+05	1.29E+06	1.73E+06	0.25	3.31E-01	2.43E-02	0.35	4.14E-01	2.10E-02	2.23E+06	7.91E+05
1.85E+04	6.76E+04	9.31E+03	6.93E+03	8.20E+03	2.29E+04	0.27	4.81E-01	2.03E-02	0.33	6.45E-01	5.79E-02	4.94E+04	1.63E+04
1.73E+04	2.19E+04	8.28E+03	7.42E+03	1.69E+04	1.76E+04	0.23	2.46E-01	6.44E-03	0.32	3.24E-01	8.09E-03	3.77E+04	1.22E+04
7.33E+04	1.53E+05	9.68E+04	2.28E+05	2.39E+05	1.80E+05	0.23	2.90E-01	1.07E-02	0.28	3.08E-01	7.51E-03	3.38E+05	9.51E+04

14 Supplemental Table S2

Accession #	Protein	# of Pep	PEPTIDE	Modification	XCorr	Charge	m/z [Da]
6754688	C-type lectin domain family 10 member A	1	ATLDNTTSK	Deamidated(5)	2.71	2	476.2
755498697	Fibrillin-1	5	CTDLDECSNGTHMCSQHADCK	Carbamidomethyl(1)Carbamidomethyl(7)Carbamidomethyl(14)Carbamidomethyl(20)Deamidated(9)Oxidation(13)	4.14	4	636.5
568933000	Platelet glycoprotein 4	5	DPFLSLVPYPISTTVGVFYPYNDTVD GVYK	Deamidated(22)	3.6	3	1122.9
568997628	Junctional adhesion molecule B	1	GGTHNNSSYTMNTK	Deamidated(6)Oxidation(11)	3.59	2	764.8
148747408	Laminin subunit alpha-4	7	ALDASNVEYENIANYVSEANETAELAL NITDR	Deamidated(10)Deamidated(19)Deamidated(27)	3.73	3	1129.5
171846253	Transmembrane glycoprotein NMB	6	VQAVLTSDSPALVGSNITFVVNLVFP R	Deamidated(16)	5.5	3	948.9
358030288	Extracellular matrix protein 1	2	QIPGLIQNMTIR	Deamidated(8)Oxidation(9)	2.49	2	700.9

MH+ [Da]	RT [min]	PSM	WT-1	WT-2	WT-3	WT-4	WT-5	WT-5-2	WT-6	WT-7	WT-8	Null-1	Null-2
951.5	18.7	1	2.78E+04	2.57E+04	4.18E+04	1.66E+03	9.70E+04	3.18E+05	5.49E+04	8.07E+04	1.96E+04	9.45E+03	2.23E+04
2542.9	17.8	10	6.45E+04	1.45E+02	3.03E+04	3.66E+01	2.43E+05	3.46E+05	6.37E+04	3.75E+03	0.00E+00	0.00E+00	7.55E+03
3366.7	79.2	204	7.44E+03	7.88E+04	7.31E+06	2.12E+03	5.90E+06	1.04E+05	1.08E+04	9.67E+04	9.45E+03	4.74E+03	1.37E+04
1528.6	16.0	2	4.91E+02	0.00E+00	0.00E+00	5.48E+03	6.78E+02	1.20E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3386.6	82.8	27	6.52E+02	2.80E+02	3.72E+05	0.00E+00	0.00E+00	0.00E+00	8.47E+03	1.58E+02	7.26E+02	1.14E+02	2.97E+02
2844.6	81.0	30	1.60E+02	0.00E+00	0.00E+00	1.04E+02	0.00E+00	1.35E+02	6.46E+05	1.31E+02	0.00E+00	1.72E+02	0.00E+00
1400.8	40.4	13	2.20E+06	2.99E+06	4.26E+06	2.78E+06	5.59E+06	5.15E+06	1.84E+06	2.44E+06	1.77E+06	0.00E+00	0.00E+00

Null-3	Null-4	Null-5	Null-6	Null-7	Null-8	Ratio Null/WT	SD	p value	N Ratio	N SD	N p value	Avg_WT	Avg_Null
6.87E+03	8.88E+03	1.88E+04	1.61E+04	3.08E+03	3.41E+04	0.20	3.98E-01	1.03E-01	0.27	4.74E-01	9.93E-02	4.05E+04	1.10E+04
5.34E+03	8.15E+02	0.00E+00	2.42E+03	1.97E+03	5.79E+02	0.03	7.47E-02	8.75E-02	0.04	1.15E-01	8.56E-02	4.09E+04	1.76E+03
8.16E+03	5.38E+03	9.91E+03	1.17E+05	1.14E+05	1.47E+04	0.02	7.92E-02	1.70E-01	0.03	1.07E-01	1.75E-01	7.33E+05	2.41E+04
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.80E+02	0.00E+00	0.01	3.92E-02	3.22E-01	0.01	4.92E-02	3.23E-01	6.97E+03	6.07E+01
2.28E+02	6.08E+02	0.00E+00	0.00E+00	0.00E+00	3.88E+02	0.00	1.92E-02	3.35E-01	0.01	2.84E-02	3.34E-01	2.21E+04	1.58E+02
5.93E+01	3.60E+01	9.79E+01	0.00E+00	4.28E+02	7.62E+01	0.00	6.50E-03	3.47E-01	0.00	8.57E-03	3.47E-01	3.86E+04	7.99E+01
2.41E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	3.06E-04	1.40E-04	0.00	4.66E-04	8.15E-06	1.81E+06	2.70E+02

Supplemental Table S3. A total of 122 proteins showed significant changes in MMP-9 null mice compared to WT mice.

Accession #	Protein	PEPTIDE	Modification	N Ratio	value
27734196	Cartilage intermediate layer protein	EQRPGQNCNSNYTVR	Carbamidomethyl(8)Deamidated(7)	13.13	9.90E-07
568933000	Platelet glycoprotein 4	QFWIFDVQNPDDVAKNSSK	Deamidated(16)	9.35	2.93E-02
158341636	latent-transforming growth factor beta-binding protein 2	DSSPQAAHVNHLSPPWGLNLTEK	Deamidated(19)	7.12	1.55E-02
6753138	Sodium/potassium-transporting ATPase subunit beta-1	LDWLGNCGLNDDSYGYR	Carbamidomethyl(7)Deamidated(6)	6.74	8.58E-03
156616286	Collagen alpha-6(VI) chain	LNANLLSSLWDTFQNK	Deamidated(15)	6.37	4.00E-02
6753484	Collagen alpha-1(VI) chain	RNFTAADWGHSR	Deamidated(2)	5.25	3.71E-02
568920137	Laminin subunit alpha-5	EQLQGINASSAAWAR	Deamidated(7)	5.09	4.82E-02
61651673	Dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit STT3B	TTLVDNNTWNNSHIALVGK	Deamidated(10)	4.81	2.68E-02
170784829	Procollagen galactosyltransferase 1	TALWVATDHNTDNTSAILR	Deamidated(13)	4.34	2.28E-02
238637279	4F2 cell-surface antigen heavy chain	APLMPWNESSIFHIPRPVSLNMTVK	Deamidated(7)Deamidated(21)Oxidation(4)Oxidation(22)	4.33	1.99E-02
755498697	Fibrillin-1	AWGTPCELCPVNTSEYK	Carbamidomethyl(6)Carbamidomethyl(9)Deamidated(13)	4.29	3.23E-02
568911077	Nicastrin	ANNSWFQSILK	Deamidated(2)	4.14	3.18E-02
755537649	Platelet endothelial cell adhesion molecule	EKEDRPFHQAVVNDTQAFWHNK	Deamidated(13)	4.10	1.20E-02
568939471	Serum paraoxonase/arylesterase 1	HANWTLTPLK	Deamidated(3)	4.05	3.78E-02
568926396	Tenascin	ASTEEVPSLENLTVTEAGWDGLR	Deamidated(11)	3.89	2.55E-02
31982236	Integrin alpha 6	LWNSTFLEEYSK	Deamidated(3)	3.76	4.97E-03
568991244	Collagen alpha-1(XIV) chain	SFMVNWTQSPGK	Deamidated(5)Oxidation(3)	3.75	3.73E-02
171846253	Transmembrane glycoprotein NMB	NLSDEIFLR	Deamidated(1)	3.66	3.19E-02
46849812	Fibronectin	WTPLNSSTIIGYR	Deamidated(5)	3.65	4.12E-02
124494256	Pro-low-density lipoprotein receptor-related protein 1	WTGHNVTVVQR	Deamidated(5)	3.62	2.40E-02
148747128	dolichyl-diphosphooligosaccharide--protein glycosyltransferase subunit STT3A	TILVDNNTWNNTHISR	Deamidated(10)	3.52	2.15E-02
6755863	Endoplasmin	HNNDTQHIWESDSNEFSVIADPR	Deamidated(3)	3.36	3.65E-02

Accession #	Protein	PEPTIDE	Modification	N Ratio	value
121674797	Palmitoyl-protein thioesterase 1	FFNDSIVDPVDSEWFGFYR	Deamidated(3)	3.29	4.37E-02
225543173	Cartilage-associated protein	DKWGLSDEHFQPRPEAVQFFNV TTLQK	Deamidated(21)	3.05	3.21E-02
569003077	Cadherin-2	RNWTINR	Deamidated(2)	3.03	1.01E-02
755537859	Solute carrier family 2, facilitated glucose transporter member 4	VIEQSYNATWLGR	Deamidated(7)	2.71	8.68E-03
31542891	Gamma-glutamyltransferase 5	LWDPSSHPGIQNISR	Deamidated(12)	2.65	2.46E-02
121583481	Inhibitor of nuclear factor kappa-B kinase-interacting protein, isoform 1	FQNITDFWK	Deamidated(3)	2.52	4.72E-02
8850219	Haptoglobin	VVLHPNHSVVDIGLIK	Deamidated(6)	2.36	1.01E-02
568991244	Collagen alpha-1(XIV) chain	VVDKGNNGSKPTSPEEVK	Deamidated(6)	2.18	3.55E-02
568972029	C-type mannose receptor 2	ASNASKPGTLER	Deamidated(3)	2.18	3.82E-02
568962784	Laminin subunit beta-2	AQAALDKANASR	Deamidated(9)	2.14	2.06E-02
7305599	Transthyretin	TLGISPFHEFADVFTANDSGHR	Deamidated(18)	2.08	1.67E-02
147904569	Carboxypeptidase N subunit 2	LQDLEITGSPVSNLSAHIFSNLSS LEK	Deamidated(13)	2.08	4.76E-02
31982712	Carboxypeptidase B2	IPFNVLMMNNVEDLIEQQTFNDTV SPR	Deamidated(20)Oxidation(7)	2.07	2.47E-02
147904569	Carboxypeptidase N subunit 2	LSLDSNNLTALHPALFHNSLR	Deamidated(6)	2.02	2.55E-03
219521935	Histocompatibility 2, Q region locus 4	TLLSYYNQSAGGSHTIQVISGCE VGSDGR	Carbamidomethyl(22)Deamidated(7)	2.02	2.72E-03
31981720	Protein Z-dependent protease inhibitor	ASQQLSNETSSFGFNLLR	Deamidated(7)	2.00	3.79E-03
568956041	Cadherin-13	NLSVVILGASDK	Deamidated(1)	1.98	2.02E-02
21389311	Intercellular adhesion molecule 1	VVLLSGVEPRPPTPQVQFTLNAS SEHDKR	Deamidated(21)	1.98	9.31E-03
568994656	Leukocyte surface antigen CD47	NSTTTDQNFSAK	Deamidated(1)Deamidated(8)	1.94	1.05E-02
31982712	Carboxypeptidase B2	EVHFFVNASDVDSVK	Deamidated(7)	1.91	1.24E-02
568990229	Leukemia inhibitory factor receptor	KVPSNSTETVIESDQFQPGVR	Deamidated(5)	1.89	7.79E-03
568913156	Prostaglandin-H2 D-isomerase	TVVAPSTEGGLNLTSTFLR	Deamidated(12)	1.89	1.45E-03
31981720	Protein Z-dependent protease inhibitor	LPYQGNATMLVVLMEK	Deamidated(6)Oxidation(9)Oxidation(14)	1.84	6.66E-03
568971816	Intercellular adhesion molecule 2	ETLKNQTFGGAETVPQEATATF NSTALKK	Deamidated(5)Deamidated(23)	1.83	1.71E-02
569006892	Very low-density lipoprotein receptor	DINTTDILR	Deamidated(3)	1.81	1.56E-03
147904569	Carboxypeptidase N subunit 2	LQLLNLSR	Deamidated(5)	1.81	8.59E-03

Accession #	Protein	PEPTIDE	Modification	N Ratio	value
31981720	Protein Z-dependent protease inhibitor	EGNFTSTFDK	Deamidated(3)	1.79	4.84E-03
226874935	Inter-alpha trypsin inhibitor, heavy chain 2	GAFISNFTMTVNGMTFTSSIK	Deamidated(6)Deamidated(12)Oxidation(9)Oxidation(14)	1.77	4.29E-02
158635948	N-acetylmuramoyl-L-alanine amidase	LEPEHLQLQNISQEQLAQVATLAK	Deamidated(10)	1.77	1.77E-02
148747546	Serine protease inhibitor A3K	NLINDYVSNQTQGMK	Deamidated(4)Deamidated(9)Oxidation(14)	1.75	1.78E-02
160358825	Beta-2-glycoprotein 1	DYRPSAGNNSLYQDTVVFK	Deamidated(8)	1.73	1.74E-03
755509347	Mannan-binding lectin serine protease 2	GDSGGALVFLDNETQR	Deamidated(12)	1.72	7.59E-04
755470204	H-2 class I histocompatibility antigen	EQNYTCHVYHEGLPEPLTLR	Carbamidomethyl(6)Deamidated(3)	1.72	4.88E-02
31982171	Murinoglobulin-1	YLNQTQQLTQK	Deamidated(3)	1.70	5.95E-03
31982171	Murinoglobulin-1	NYEVQLFHVNATVTEEGTGLEFSR	Deamidated(10)	1.70	3.71E-02
156616286	Collagen alpha-6(VI) chain	EANQTQLR	Deamidated(3)	1.70	4.49E-02
19527214	Apolipoprotein N	TQNGSLPAVTR	Deamidated(3)	1.66	1.48E-02
109627652	Complement factor H	LTEFTHNSTMDYK	Deamidated(7)Oxidation(10)	1.66	2.32E-02
113865991	LPS-binding protein	VYHQAGYLNFSITDDMLPHDSGIR	Deamidated(9)Oxidation(16)	1.66	3.11E-02
568956041	Cadherin-13	NLSVVILGASDKDLHPNTDPFK	Deamidated(1)	1.65	1.28E-02
19527130	EMILIN-1	ESNSTSLTQAALLEK	Deamidated(3)	1.65	1.83E-02
13507644	Carboxypeptidase N catalytic chain	GMVLDENSNLGTGAVISVTGINHDVTSGEHGDIYFR	Deamidated(10)Oxidation(2)	1.65	8.97E-03
568921717	Complement factor I	FNVSLIYGR	Deamidated(2)	1.64	7.46E-03
755532856	Laminin, alpha 2	VFQAESHAACLNDSSAVLDGILDEAK	Deamidated(12)	1.64	1.07E-02
225007625	Interleukin-6 receptor subunit beta	VKPTPPYNLSVTNSEEELSSILK	Deamidated(8)	1.62	3.06E-02
568956041	Cadherin-13	ANYNLPIMVTDGKPPMTNITDLR	Deamidated(19)Oxidation(8)Oxidation(17)	1.62	6.08E-03
58037159	Complement component C8 gamma chain	EANLTEDQILFFPK	Deamidated(3)	1.61	2.18E-02
226371752	Beta-type platelet-derived growth factor receptor	AINISVIENGYVR	Deamidated(3)Deamidated(9)	1.61	3.74E-02
568953122	Insulin receptor	ELGLYNLMNITR	Deamidated(9)Oxidation(8)	1.59	3.76E-02
568956041	Cadherin-13	INNTHALVSLQLNLNK	Deamidated(2)	1.58	1.60E-02
6753138	Sodium/potassium-transporting ATPase subunit beta-1	VLGFKPKPPKNESLETYPLMMK	Carbamyl(10)Deamidated(11)Oxidation(20)Oxidation(21)	1.57	3.51E-02
156616286	Collagen alpha-6(VI) chain	GVPQVLIVITDGESHDAEKLNTTAK	Deamidated(21)	1.57	2.55E-02

Accession #	Protein	PEPTIDE	Modification	N Ratio	value
6753138	Sodium/potassium-transporting ATPase subunit beta-1	FKLDWLGNCGLNDDSYGYR	Carbamidomethyl(9)Deamidated(8)	1.56	1.28E-03
31981720	Protein Z-dependent protease inhibitor	EGNFTSTFDKK	Deamidated(3)	1.56	4.09E-02
7242138	Sodium/potassium-transporting ATPase subunit beta-2	FLEPYNDSIQAQK	Deamidated(6)	1.55	2.38E-02
568990229	Leukemia inhibitory factor receptor	IEGLTNETYR	Deamidated(6)	1.55	9.48E-03
755493733	Complement component 4 binding protein	LACLNGTVLR	Carbamidomethyl(3)Deamidated(5)	1.53	3.37E-02
569008736	Sodium/hydrogen exchanger 7	AFSTLLVNVSGK	Deamidated(8)	1.53	4.96E-02
27734196	Cartilage intermediate layer protein	LPHDCFQNASNSFYDVGR	Carbamidomethyl(5)Deamidated(8)	1.51	7.57E-03
568991301	Plexin B2	VTVEGMEYVFYNDTK	Deamidated(12)Oxidation(6)	1.48	2.18E-02
31791059	CD166 antigen	TVNSLNVSAISIPHEDEADDISDENR	Deamidated(6)	1.46	4.73E-02
568915167	Plasma protease C1 inhibitor	DTYVNASQSPLYGSSPR	Deamidated(5)	1.41	2.37E-02
225735655	prosaposin	TNSSFIQGFVDHVK	Deamidated(2)	1.38	3.47E-02
148232950	carboxypeptidase Q	EVMNLLQPLNVTK	Deamidated(10)Oxidation(3)	1.38	2.65E-02
568956156	G-protein coupled receptor 56	VTNLSDPVVLTFQHQPQPK	Deamidated(3)	1.37	3.05E-02
113205065	Tissue inhibitor of metalloproteinase 1	FMGSPEINETTLYQR	Deamidated(8)Oxidation(2)	1.36	4.68E-02
156616286	Collagen alpha-6(VI) chain	TEFNLTSSYSSK	Deamidated(4)	1.34	2.94E-02
506326690	Prion-like protein doppel	EMLVTSCVNATQAANQAEFSR	Carbamidomethyl(7)Deamidated(9)Oxidation(2)	1.32	4.93E-02
755504148	Lysosomal protein NCU-G1	LLEFDSTNASEGAQPPGKPYPPYSLAK	Deamidated(8)	1.29	4.16E-02
124494256	Pro-low-density lipoprotein receptor-related protein 1	FNSTEYQVVTR	Deamidated(2)	0.79	3.73E-02
224994201	Inactive serine protease PAMR1	SPGFKNLTLHYGMVR	Deamidated(6)Oxidation(13)	0.78	1.61E-02
568933707	ADP-ribosyl cyclase 2	DSSGVINVMLNGSEPK	Deamidated(11)Oxidation(9)	0.77	4.47E-02
568915220	CD44 antigen	TEAADLCQAFNSTLPTMDQMK	Carbamidomethyl(7)Deamidated(11)Oxidation(17)Oxidation(20)	0.77	3.58E-02
568941620	Glucoside xylosyltransferase 2	QFNSTQLAAMAPEHEIPK	Deamidated(3)Oxidation(10)	0.77	4.85E-02
529250188	Angiotensin-converting enzyme	QQYNSLLSNMSR	Deamidated(9)Oxidation(10)	0.77	3.93E-02
160333204	Transmembrane protein 87A	LFQNCSELYK	Carbamidomethyl(5)Deamidated(4)	0.76	4.87E-02
755522163	Integrin alpha-M	AVNQTGALYQCDYSTSR	Carbamidomethyl(11)Deamidated(3)	0.73	1.49E-02
755522163	Integrin alpha-M	YLNFTASEMTSK	Deamidated(3)Oxidation(9)	0.73	2.97E-02
392871558	Receptor-type tyrosine-protein phosphatase C	TSRPTDNSINVTCGPPYETNGPK	Carbamidomethyl(13)Deamidated(10)Deamidated(20)	0.70	4.76E-02
568967343	tetraspanin 8	ILNETLYENAK	Deamidated(3)	0.70	1.33E-02

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Accession #	Protein	PEPTIDE	Modification	N Ratio	value
124494256	Prolow-density lipoprotein receptor-related protein 1	DNTTCYEFK	Carbamidomethyl(5)Deamidated(2)	0.70	2.30E-02
568958751	Hypoxia up-regulated protein 1	VFGSQNLTTVK	Deamidated(6)	0.69	7.55E-03
172072617	Peptidyl-prolyl cis-trans isomerase FKBP9	YHYNGTFLDGTLDSSHNR	Deamidated(4)	0.69	4.89E-02
19527206	CD276 antigen	VVLGANGTYSCVLR	Carbamidomethyl(11)Deamidated(6)	0.68	4.89E-02
153791389	Integrin alpha-1	YNHTGQVVIYK	Deamidated(2)	0.67	2.67E-02
124494256	Prolow-density lipoprotein receptor-related protein 1	TCVSNCTASQFVCK	Carbamidomethyl(2)Carbamidomethyl(6)Carbamidomethyl(13)Deamidated(5)	0.67	1.53E-02
568915418	Prolyl endopeptidase FAP	SVNATDYGLSPDR	Deamidated(3)	0.66	4.83E-02
226246610	Alpha-mannosidase 2	GSPGNASQGSIIHLHSPQLALQADPR	Deamidated(5)	0.65	1.77E-02
755522163	Integrin alpha-M	DKVTFINTTR	Deamidated(7)	0.63	2.12E-03
153792543	ATP-binding cassette sub-family A member 9	SMNELDLNYSIDAVR	Deamidated(8)Oxidation(2)	0.63	3.17E-02
568967005	Receptor-type tyrosine-protein phosphatase beta	SFPVYINGSTVPSPVK	Deamidated(7)	0.62	2.20E-02
45504394	Integrin beta-1	LRNPCTSEQNCTSPFSYK	Carbamidomethyl(5)Carbamidomethyl(11)Deamidated(10)	0.62	4.97E-02
145966911	Transmembrane emp24 domain-containing protein 9	FTFTSHTPGEHQICLHSNSTK	Carbamidomethyl(14)Deamidated(18)	0.61	3.32E-02
154240724	Ectonucleotide pyrophosphatase/phosphodiesterase family member 3	LNLSEGEVAATVK	Deamidated(2)	0.61	2.00E-02
254939534	Peptidyl-prolyl cis-trans isomerase FKBP10	YHYNCSLLDGTR	Carbamidomethyl(5)Deamidated(4)	0.60	4.32E-02
124487415	Latent-transforming growth factor beta-binding protein 3	DSCQQGSNMTLIGENGHSTDTLTGSGFR	Carbamidomethyl(3)Deamidated(8)Deamidated(15)Oxidation(9)	0.60	3.72E-02
124494256	Prolow-density lipoprotein receptor-related protein 1	GCKDNATDSVPLR	Carbamidomethyl(2)Deamidated(5)	0.59	4.92E-02
568988705	Transmembrane and TPR repeat-containing protein 4	NLADQGNQTAAIK	Deamidated(7)	0.58	4.12E-03
755525407	Fibrinogen-like protein 1	IDLTDFEKNSSFAQYQSFK	Deamidated(9)	0.58	1.43E-02
228008326	Probable carboxypeptidase X1	SRNSTGMDIVFPANSDAETPVLNLLPEPQVAR	Deamidated(3)Oxidation(7)	0.58	1.98E-02
269315863	Collagen alpha-5(VI)	YQEIIIELESSLNK	Deamidated(12)	0.57	4.52E-02
568989825	Lysyl oxidase-like protein 2	DPVKNATCENGQPAVVSCVPSQIFSPDGPSR	Carbamidomethyl(8)Carbamidomethyl(18)Deamidated(5)Deamidated(10)	0.57	4.59E-02
224967060	Matrilin-4	SLDVGLNATR	Deamidated(7)	0.56	3.07E-02
228008326	Probable carboxypeptidase X1	QVNEQCPNITR	Carbamidomethyl(6)Deamidated(8)	0.56	2.67E-02
568987063	stabilin-1	GCADYCNQTITK	Carbamidomethyl(2)Carbamidomethyl(6)Deamidated(7)	0.55	3.62E-02

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Accession #	Protein	PEPTIDE	Modification	N Ratio	value
124494256	Prolow-density lipoprotein receptor-related protein 1	FGTCSQLCNNTK	Carbamidomethyl(4)Carbamidomethyl(8)Deamidated(9)	0.55	2.72E-02
115511022	Vwf protein	VPLHCTNGSVVYHEVINAMQCR	Carbamidomethyl(5)Carbamidomethyl(21)Deamidated(7)Oxidation(19)	0.55	3.53E-02
568975598	Complement C1q tumor necrosis factor-related protein 2	ILMNEGGHYNASSGK	Deamidated(10)Oxidation(3)	0.54	3.06E-02
224967062	Macrophage mannose receptor 1	TSYCNEFYFLCK	Carbamidomethyl(4)Carbamidomethyl(12)Deamidated(5)	0.54	8.94E-04
568926396	Tenascin	TPMLSTDVSTAREPEIGNLNVSDEVTPK	Deamidated(20)Oxidation(3)	0.54	4.47E-02
12963767	KDEL motif-containing protein 1	EMNCSETISQIQK	Carbamidomethyl(4)Deamidated(3)Oxidation(2)	0.53	4.31E-03
165905611	latent transforming growth factor beta binding protein 4	VNGSCVDVDECATGGR	Carbamidomethyl(5)Carbamidomethyl(11)Deamidated(2)	0.52	2.73E-02
225543173	Cartilage-associated protein	NCSAATPAPAPAGPASHAELR	Carbamidomethyl(2)Deamidated(1)	0.52	1.85E-02
568979644	Fibulin-5	NHTCTSLQTCYNLQGGFK	Carbamidomethyl(4)Carbamidomethyl(10)Deamidated(1)	0.52	4.64E-02
85861262	Netrin receptor UNC5B	LSDTANYTCVAK	Carbamidomethyl(9)Deamidated(6)	0.52	4.83E-02
568923623	Translocon-associated protein subunit beta	IAPASNVSHTVVLRPLK	Deamidated(6)	0.52	8.42E-03
46849812	Fibronectin	VFAVHQGRESNPLTAQQTTKLDAPTNLQFVNETDR	Deamidated(31)	0.50	1.61E-02
45504394	Integrin beta-1	KDTCAQECSHFNLTK	Carbamidomethyl(4)Carbamidomethyl(8)Deamidated(12)	0.50	3.70E-02
755522163	Integrin alpha-M	TPVLNCSVAVCK	Carbamidomethyl(6)Carbamidomethyl(11)Deamidated(5)	0.49	5.18E-03
269315863	Collagen alpha-5(VI)	SNDSVLEPANR	Deamidated(2)	0.49	4.60E-02
166064058	Slit homolog 2 protein	DLEVLTLNNNNITR	Deamidated(11)	0.48	8.87E-03
218931165	Procollagen-lysine,2-oxoglutarate 5-dioxygenase 2	YNCSIESPR	Carbamidomethyl(3)Deamidated(2)	0.47	1.53E-02
568940646	Fibulin-2	EGETCGAEDNDTCGVSLYK	Carbamidomethyl(5)Carbamidomethyl(13)Deamidated(10)	0.46	4.26E-03
755498697	Fibrillin-1	CDSGFALDSEERNCTDIDECR	Carbamidomethyl(1)Carbamidomethyl(14)Carbamidomethyl(20)Deamidated(13)	0.45	4.46E-02
568930638	Basement membrane-specific heparan sulfate proteoglycan core protein	CDGDFDCEDRTDEANCSVK	Carbamidomethyl(1)Carbamidomethyl(7)Carbamidomethyl(16)Deamidated(15)	0.44	4.65E-02
269315863	Collagen alpha-5(VI)	LEGVTMFAMGIEGANNTQLEDIVSYPSR	Deamidated(16)Oxidation(6)Oxidation(9)	0.44	4.16E-02
46849812	Fibronectin	HEEGHMLNCTCFGQGR	Carbamidomethyl(9)Carbamidomethyl(11)Deamidated(8)Oxidation(6)	0.43	2.50E-02

Accession #	Protein	PEPTIDE	Modification	N Ratio	value
47059073	Thrombospondin 1	GCSSSATNVLLTLDNNVVNGSS PAIR	Carbamidomethyl(2)Deamidated(19)	0.39	2.34E-02
269315863	Collagen alpha-5(VI)	SSANQSEFQQQIQK	Deamidated(4)	0.38	8.64E-03
568940646	Fibulin-2	DLDECALGTHNCSEAETCHNIQ GSFR	Carbamidomethyl(5)Carbamidomethyl(12)C arbamidomethyl(18)Deamidated(11)	0.37	1.39E-02
45504394	Integrin beta-1	KENSSEICSNNGECVCGQCVCR	Carbamidomethyl(8)Carbamidomethyl(14)C arbamidomethyl(16)Carbamidomethyl(19)Ca rbamidomethyl(21)Deamidated(3) Deamidated(11)	0.37	2.93E-02
46849812	Fibronectin	RHEEGHMLNCTCFGQGR	Carbamidomethyl(10)Carbamidomethyl(12) Deamidated(9)Oxidation(7)	0.35	2.10E-02
47059073;56 8916267	thrombospondin 1	VSCPIMPCS NATVPDGECCPR	Carbamidomethyl(3)Carbamidomethyl(8) Carbamidomethyl(18)Carbamidomethyl(19) Deamidated(10)Oxidation(6)	0.32	8.09E-03
145966840	Eosinophil peroxidase	ALLPFDNLHEDPCLLTNR	Carbamidomethyl(13)Deamidated(17)	0.28	7.51E-03
358030288	Extracellular matrix protein 1	QIPGLIQNMTIR	Deamidated(8)Oxidation(9)	0.00	8.15E-06

Supplemental Table S4. Cellular location of all identified proteins								
GO-ID	Cellular component	Count	%	PValue	Total number of DAVID annotated N-glycoproteins	Total number of DAVID annotated mouse proteins	Fold Enrichment	Benjamini
5576	extracellular region	164	34.67	3.16E-35	456	12504	2.68	7.74E-33

44421	extracellular region part	102	21.56	5.39E-31	456	12504	3.61	6.60E-29
31012	extracellular matrix	61	12.90	1.74E-27	456	12504	5.41	1.42E-25
5578	proteinaceous extracellular matrix	57	12.05	5.08E-25	456	12504	5.26	3.11E-23
9986	cell surface	47	9.94	1.02E-16	456	12504	4.23	5.44E-15

44420	extracellular matrix part	25	5.29	1.30E-14	456	12504	7.45	5.30E-13
5764	lysosome	31	6.55	1.67E-12	456	12504	4.78	5.83E-11
323	lytic vacuole	31	6.55	1.94E-12	456	12504	4.75	5.93E-11
9897	external side of plasma membrane	33	6.98	2.93E-12	456	12504	4.39	7.98E-11
5604	basement membrane	20	4.23	8.12E-12	456	12504	7.51	1.99E-10
5773	vacuole	32	6.77	1.17E-11	456	12504	4.30	2.60E-10
5615	extracellular space	52	10.99	4.48E-11	456	12504	2.79	9.15E-10
8305	integrin complex	13	2.75	8.36E-11	456	12504	12.73	1.58E-09
5788	endoplasmic reticulum lumen	18	3.81	5.47E-10	456	12504	6.86	9.57E-09

5783	endoplasmic reticulum	64	13.53	2.47E-08	456	12504	2.09	4.03E-07
5886	plasma membrane	156	32.98	6.08E-08	456	12504	1.47	9.31E-07
44432	endoplasmic reticulum part	28	5.92	8.35E-08	456	12504	3.32	1.20E-06

5887	integral to plasma membrane	44	9.30	6.99E-07	456	12504	2.27	9.51E-06
31226	intrinsic to plasma membrane	45	9.51	7.93E-07	456	12504	2.24	1.02E-05
43235	receptor complex	15	3.17	1.55E-06	456	12504	4.96	1.90E-05

31224	intrinsic to membrane	262	55.39	7.39E-06	456	12504	1.21	8.62E-05
42383	sarcolemma	10	2.11	4.11E-05	456	12504	5.83	4.58E-04

16021	integral to membrane	250	52.85	4.83E-05	456	12504	1.20	5.14E-04
5605	basal lamina	6	1.27	6.30E-05	456	12504	12.66	6.43E-04

44459	plasma membrane part	87	18.39	2.13E-04	456	12504	1.46	2.09E-03
48770	pigment granule	12	2.54	2.47E-04	456	12504	3.87	2.32E-03
42470	melanosome	12	2.54	2.47E-04	456	12504	3.87	2.32E-03
5770	late endosome	8	1.69	9.62E-04	456	12504	4.99	8.69E-03
16011	dystroglycan complex	4	0.85	1.50E-03	456	12504	15.67	1.31E-02
16023	cytoplasmic membrane-bounded vesicle	28	5.92	2.48E-03	456	12504	1.85	2.07E-02
31988	membrane-bounded vesicle	28	5.92	2.99E-03	456	12504	1.83	2.42E-02
5581	collagen	5	1.06	4.34E-03	456	12504	7.22	3.38E-02
31982	vesicle	32	6.77	4.62E-03	456	12504	1.69	3.48E-02
31410	cytoplasmic vesicle	31	6.55	6.32E-03	456	12504	1.67	4.60E-02
16010	dystrophin-associated glycoprotein comp	4	0.85	8.24E-03	456	12504	9.14	5.79E-02

31225	anchored to membrane	16	3.38	8.71E-03	456	12504	2.12	5.94E-02
45121	membrane raft	9	1.90	1.20E-02	456	12504	2.90	7.91E-02
5614	interstitial matrix	4	0.85	1.29E-02	456	12504	7.83	8.25E-02
8250	oligosaccharyltransferase complex	3	0.63	1.80E-02	456	12504	13.71	1.10E-01
16012	sarcoglycan complex	3	0.63	1.80E-02	456	12504	13.71	1.10E-01
5606	laminin-1 complex	3	0.63	1.80E-02	456	12504	13.71	1.10E-01
5583	fibrillar collagen	3	0.63	2.46E-02	456	12504	11.75	1.45E-01
43256	laminin complex	3	0.63	2.46E-02	456	12504	11.75	1.45E-01
5794	Golgi apparatus	36	7.61	2.52E-02	456	12504	1.45	1.45E-01
30140	trans-Golgi network transport vesicle	4	0.85	2.60E-02	456	12504	6.09	1.46E-01
30141	secretory granule	10	2.11	2.68E-02	456	12504	2.34	1.47E-01
267	cell fraction	32	6.77	2.88E-02	456	12504	1.47	1.53E-01
5771	multivesicular body	3	0.63	4.01E-02	456	12504	9.14	2.04E-01
5768	endosome	16	3.38	4.21E-02	456	12504	1.74	2.09E-01
5626	insoluble fraction	28	5.92	4.74E-02	456	12504	1.45	2.28E-01

FDR	Genes
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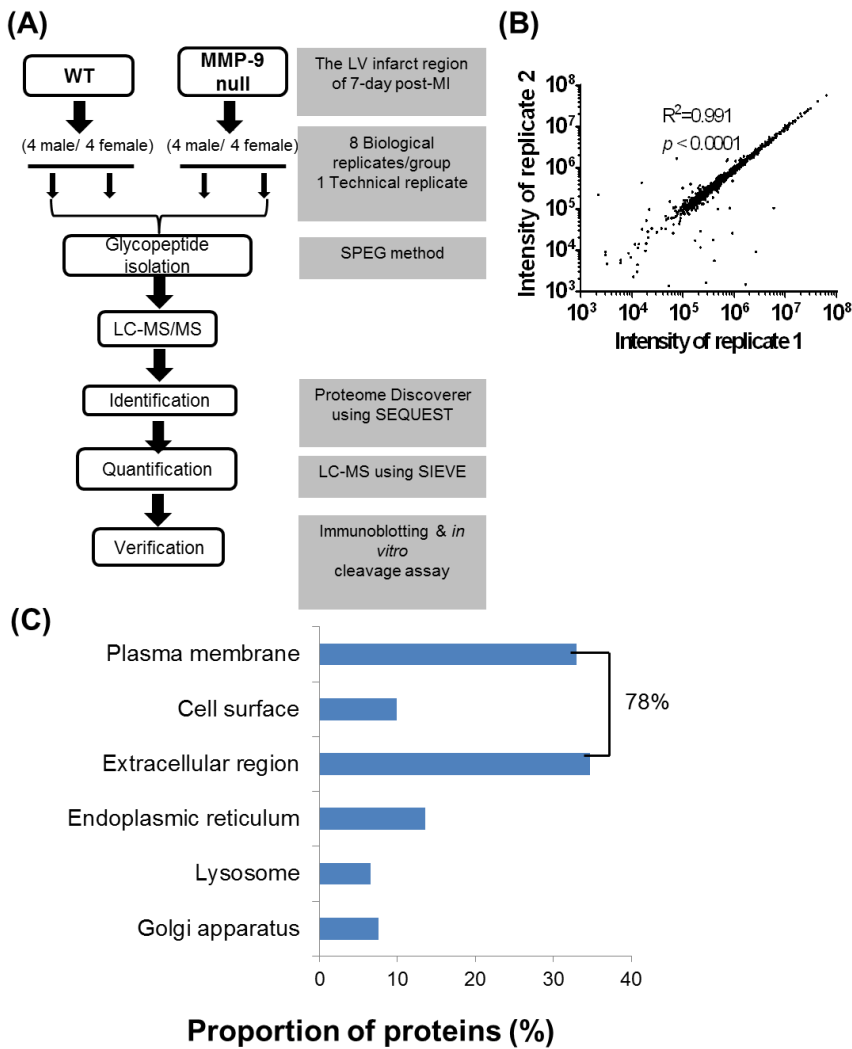
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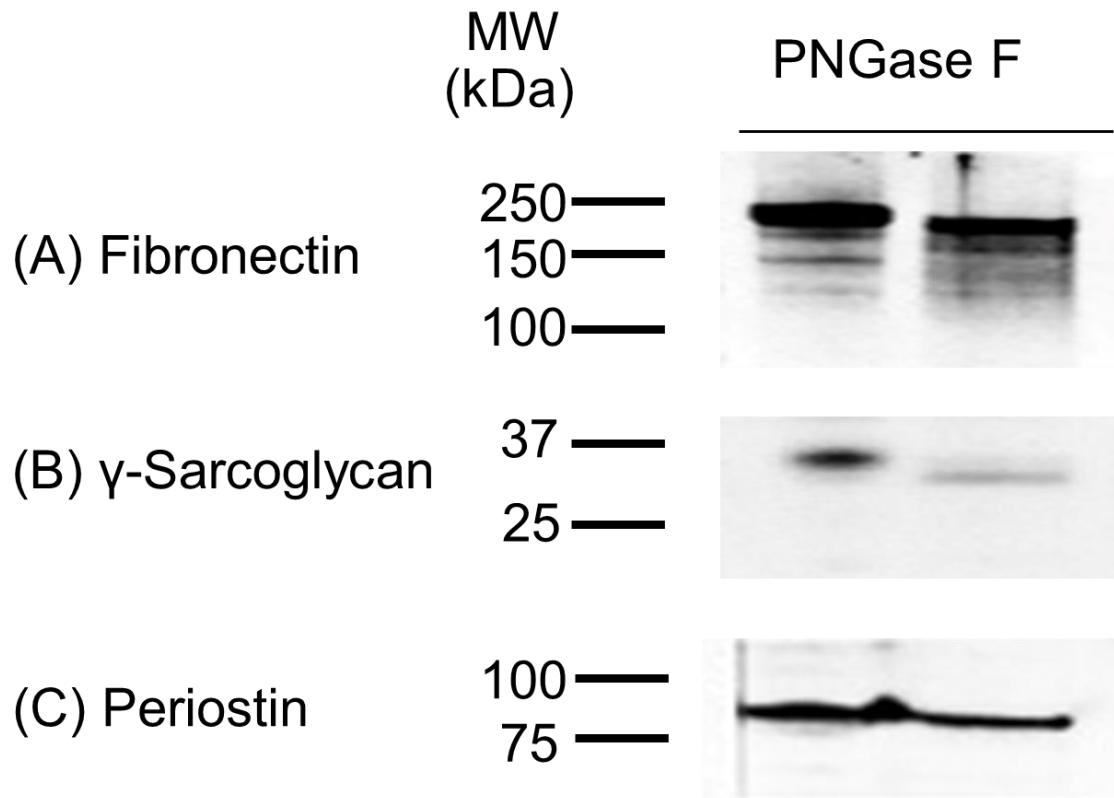
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SUPPLEMENTAL FIGURE LEGENDS



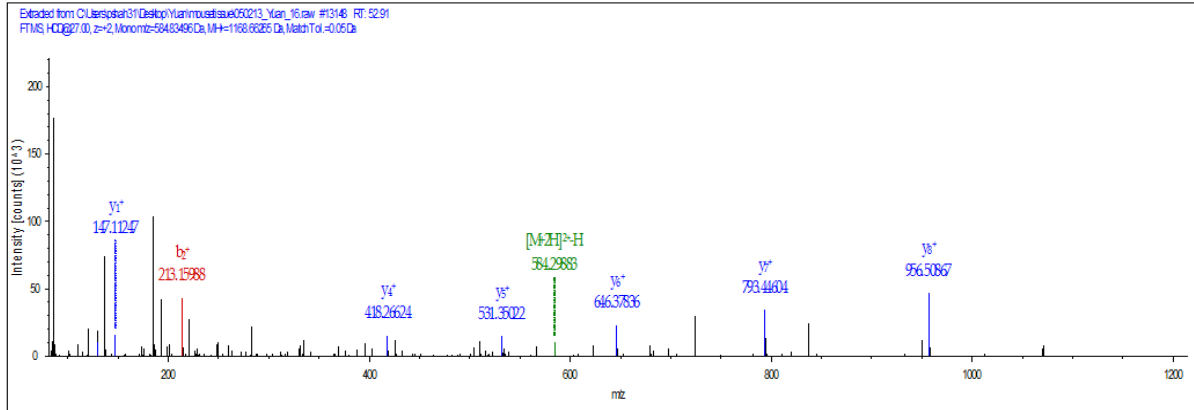
Supplemental Figure S1. Experimental design. (A) *N*-glycosylated peptides were isolated from infarcts (LVI) of WT and MMP-9 null mice at day 7 post-myocardial infarction using Solid-Phase Extraction of N-linked Glycopeptides (SPEG) method and subjected to LC-MS/MS analysis (n=8/group). (B) Plot of the technical replicates shows good reproducibility ($R^2=0.991$, $p < 0.0001$; See also Supplemental Table S1). LC-MS method was used to quantify the peptide abundance followed by immunoassay validation and *in vitro* cleavage assay. (C) Gene Ontology (GO) analysis reveals the cellular components of the identified *N*-glycoproteins. See also Supplemental Table S4.



Supplemental Figure S2. Confirmation of the glycosylation for fibronectin, γ -sarcoglycan, and periostin. The molecular weight of these proteins was reduced after PNGase F treatment indicating these proteins were in fact glycosylated.

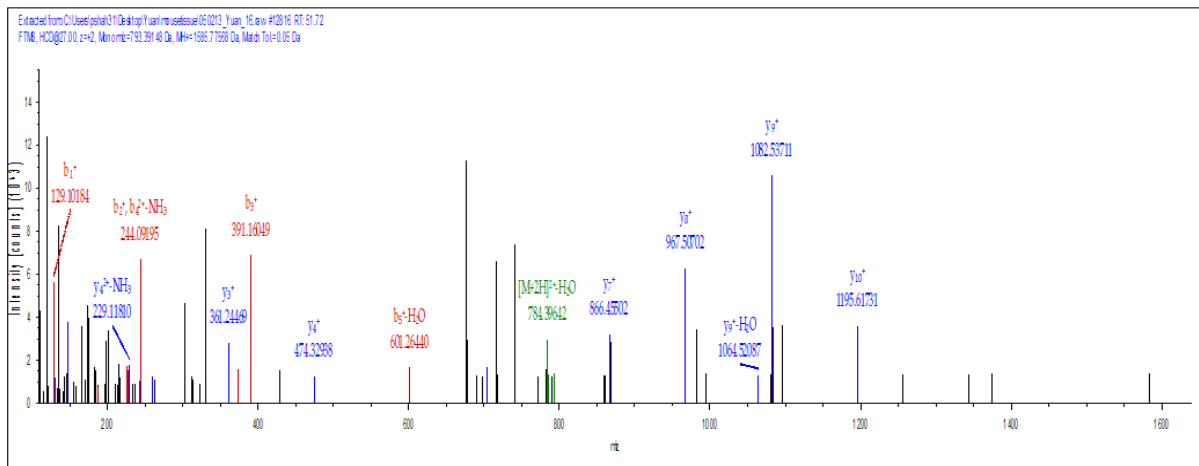
Protein Group

Accession	Protein	Peptide	Modification	XCorr	Charge	m/z [Da]	MH+ [Da]	RT [min]
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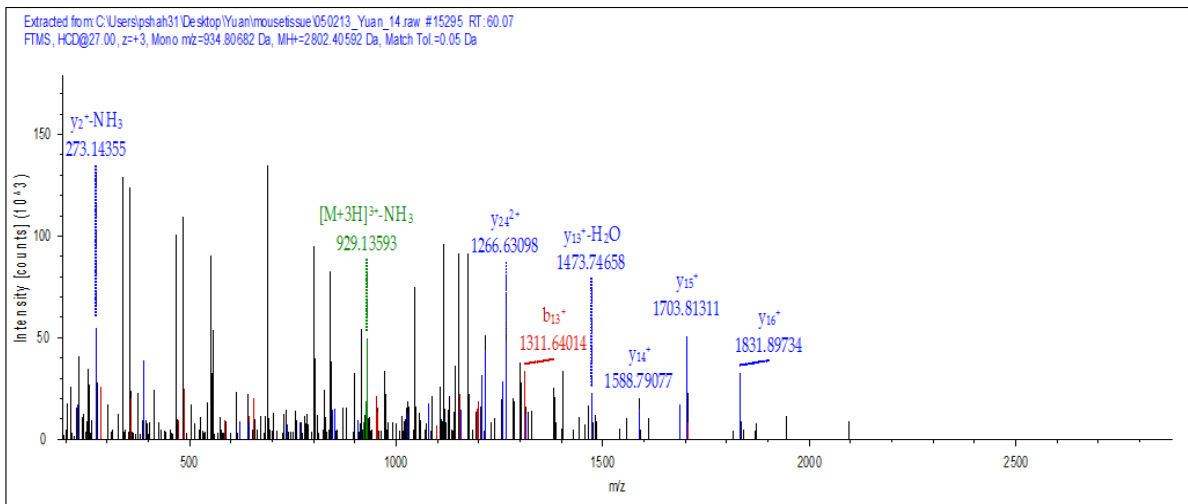
UDP-GalNAc: beta-1,3-N-
acetylgalactosaminyltransferase
se 1

IPI00119759.1	se 1	QDFLDTYNNLTLK	Deamidated(8)	2.44	2	793.391	1585.776	51.72
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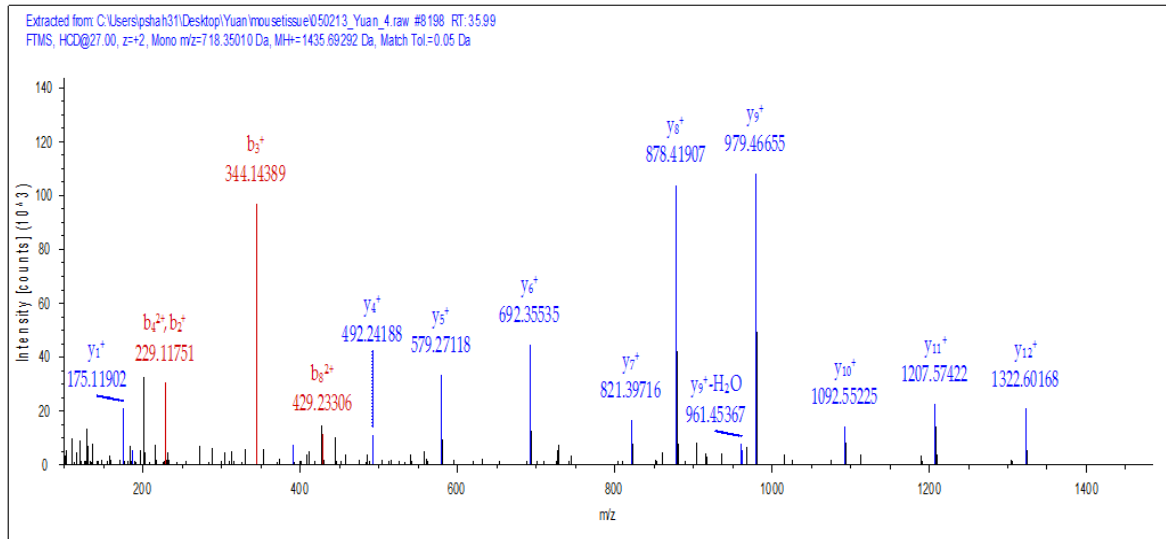


INTTIGSVAAQDPDAARN
PVKYSVDR Deamidated(18):C
arabamyl

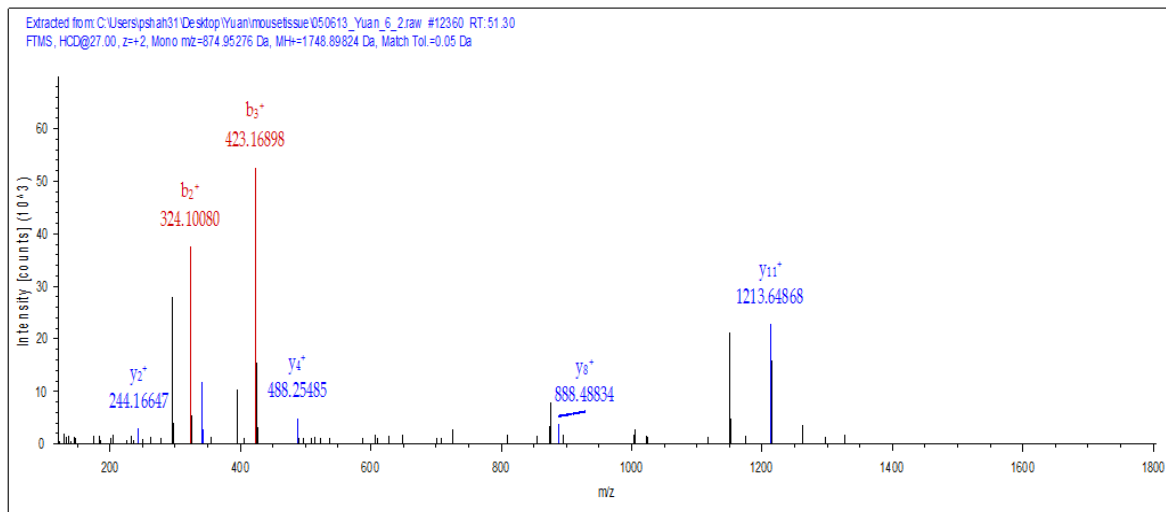
IPI00123942.2	Cadherin-6	PVKYSVDR	Deamidated(18):C arabamyl	3.27	3	934.807	2802.406	60.07
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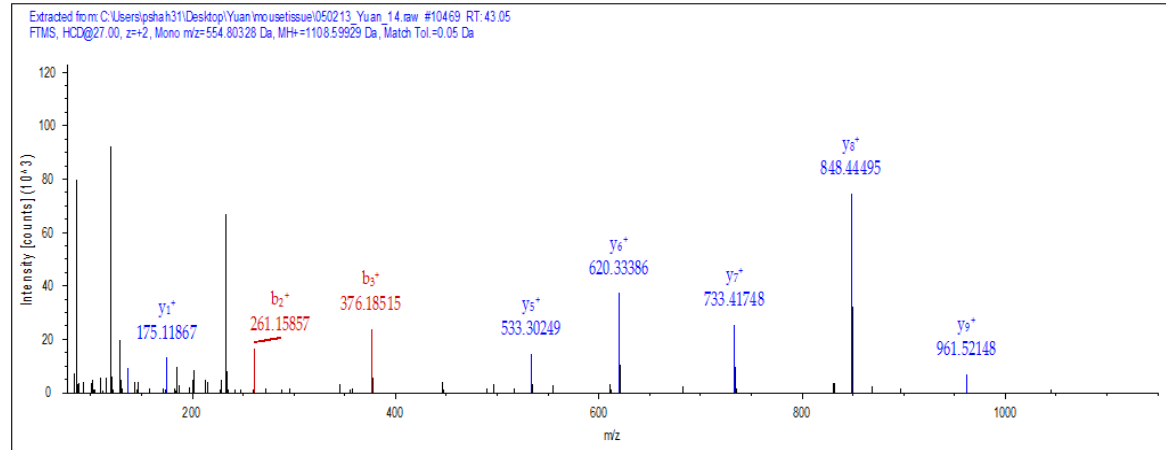
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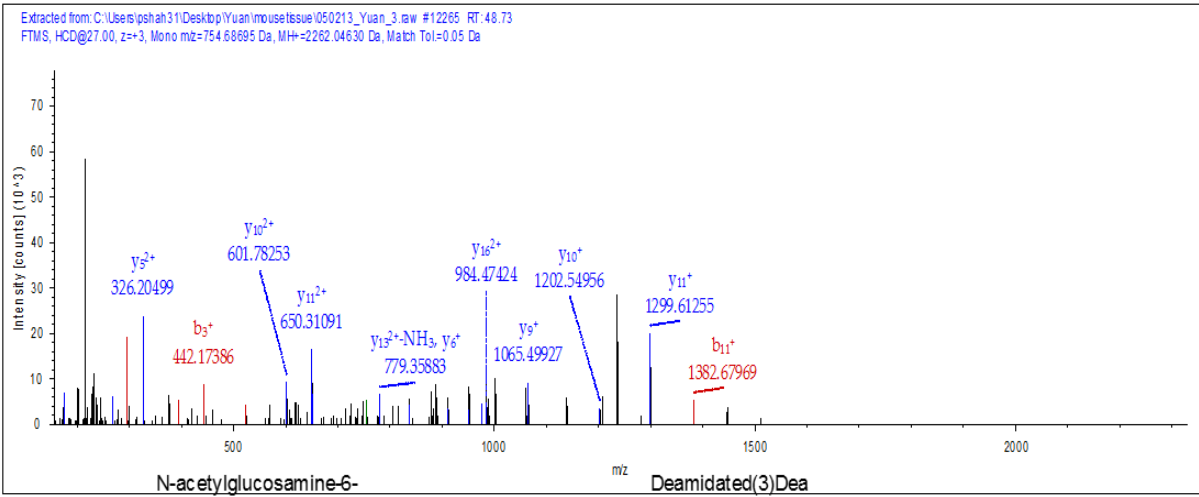
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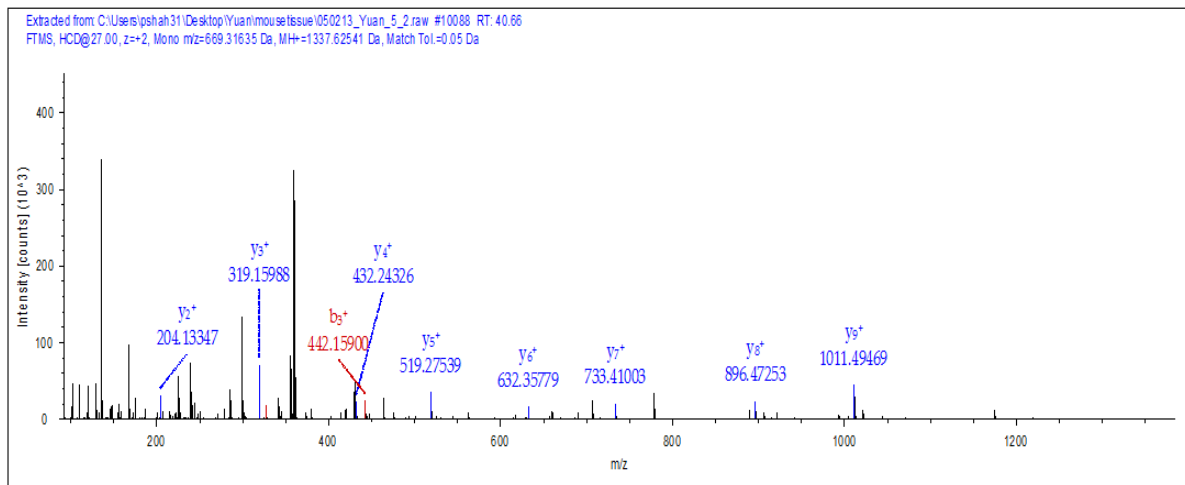
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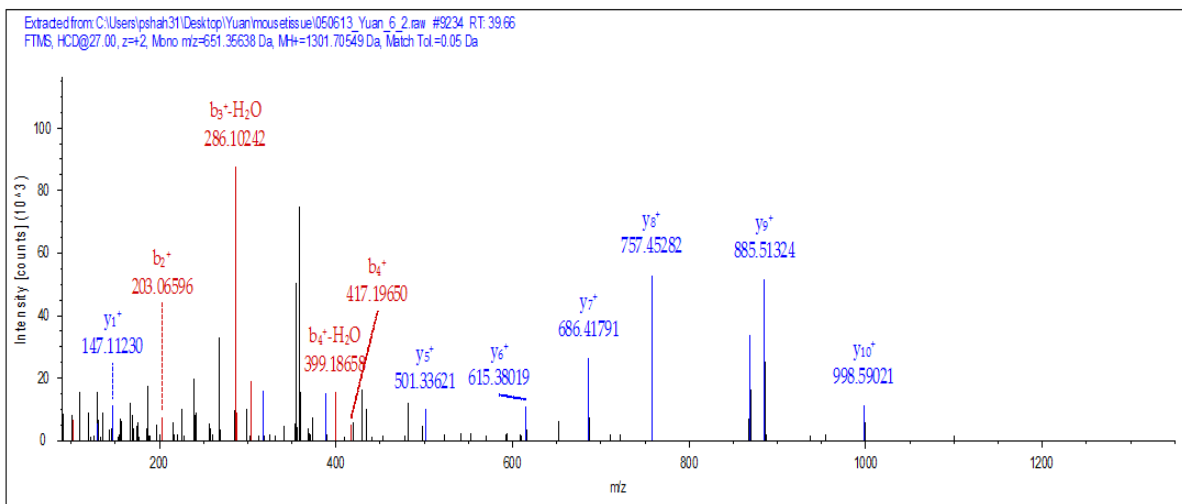
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 R (15) 3.64 3 754.687 2262.046 48.73



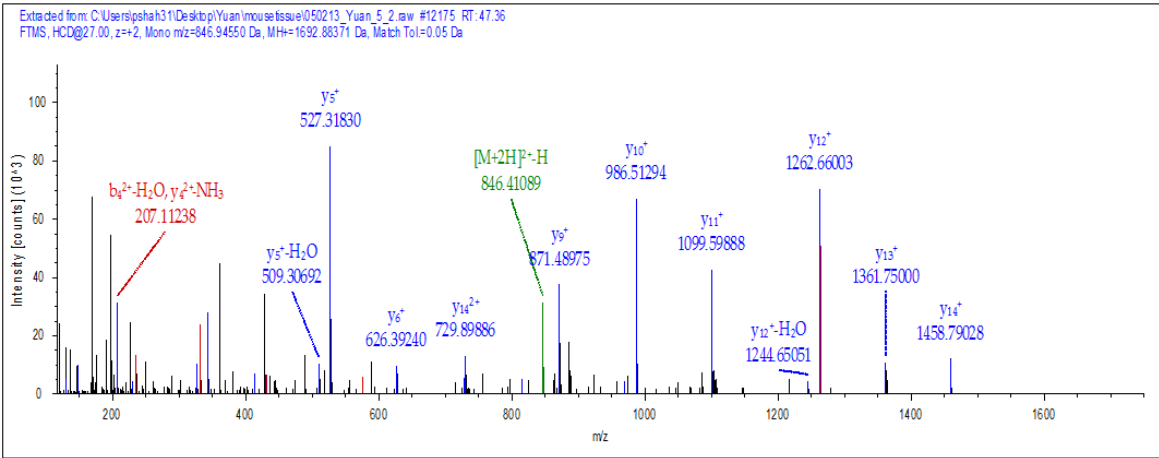
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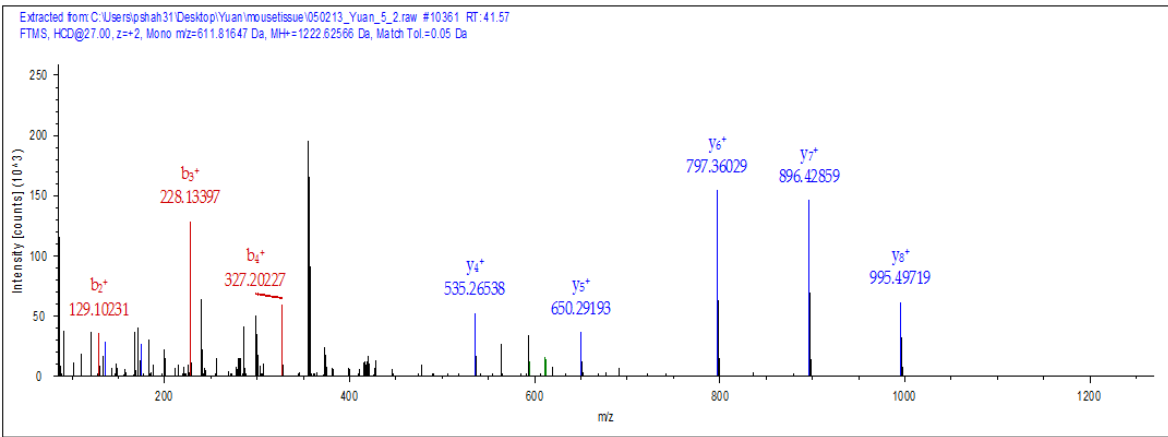
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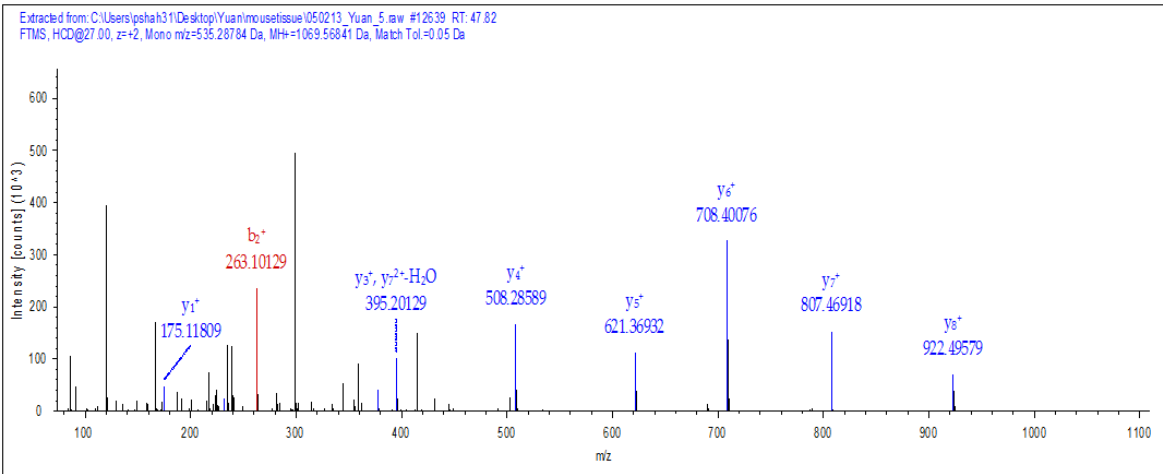
Receptor-type tyrosine-
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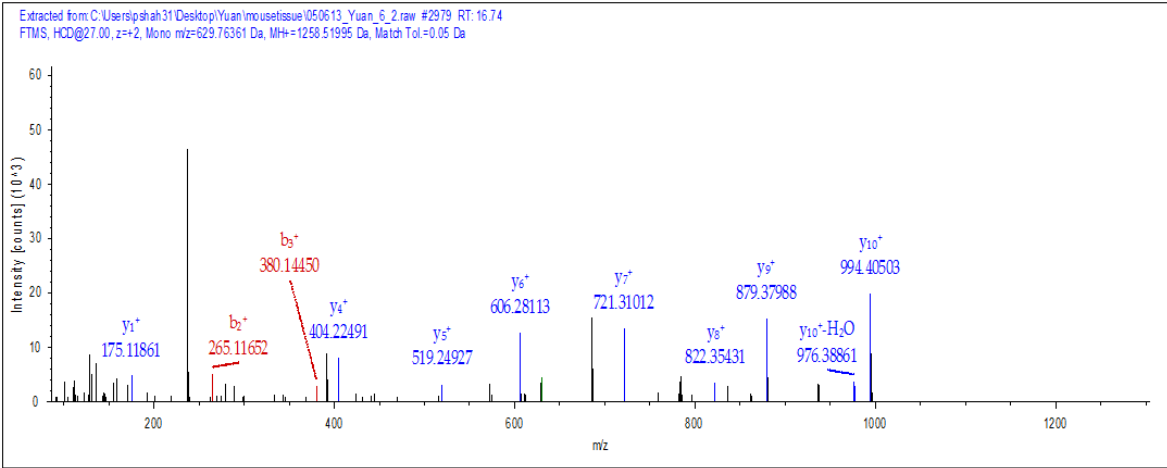
Transforming growth factor
 IPI00314779.1 beta receptor type 3 AGVVFVFNCSLR Carbamidomethyl(8)Deamidated(7) 2.67 2 611.816 1222.626 41.57



IPI00320675.2 Complement factor I FNVSLIYGR Deamidated(2) 2.6 2 535.288 1069.568 47.82

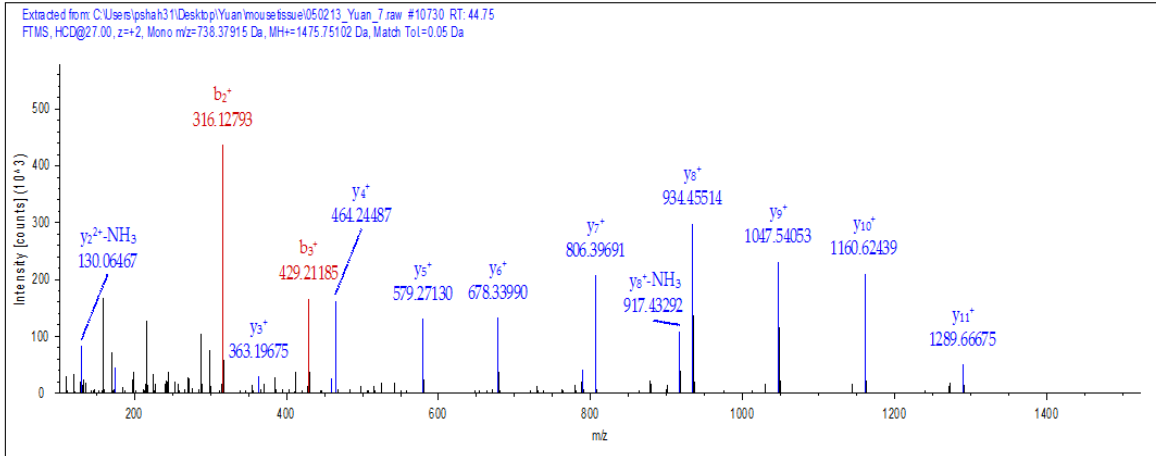


IPI00404126.2 Tetraspanin 3 TYNGTNSDAASR Deamidated(3) 2.69 2 629.270 1257.534 16.06



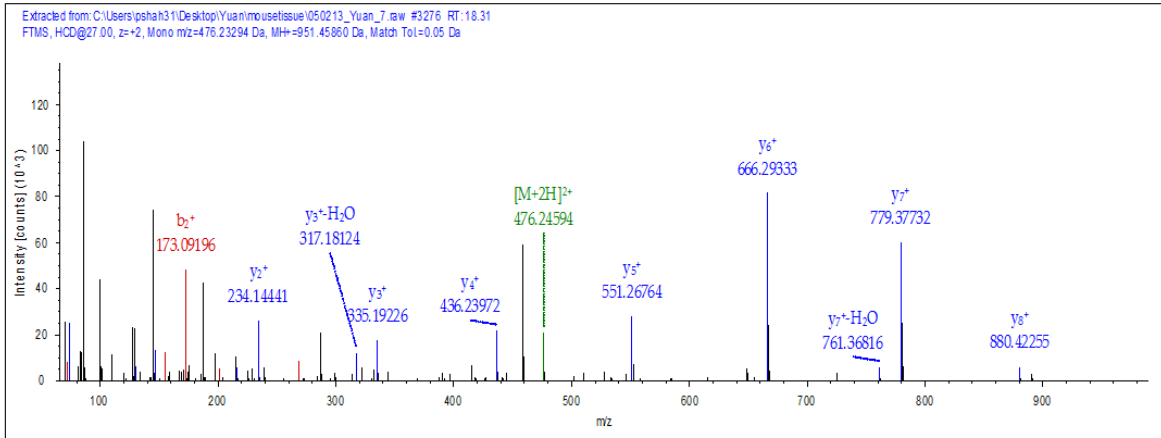
Keratin, type II cytoskeletal

IPI00462140.1 1b WELLQQVNTSTR Deamidated(8) 3.65 2 738.379 1475.751 44.75

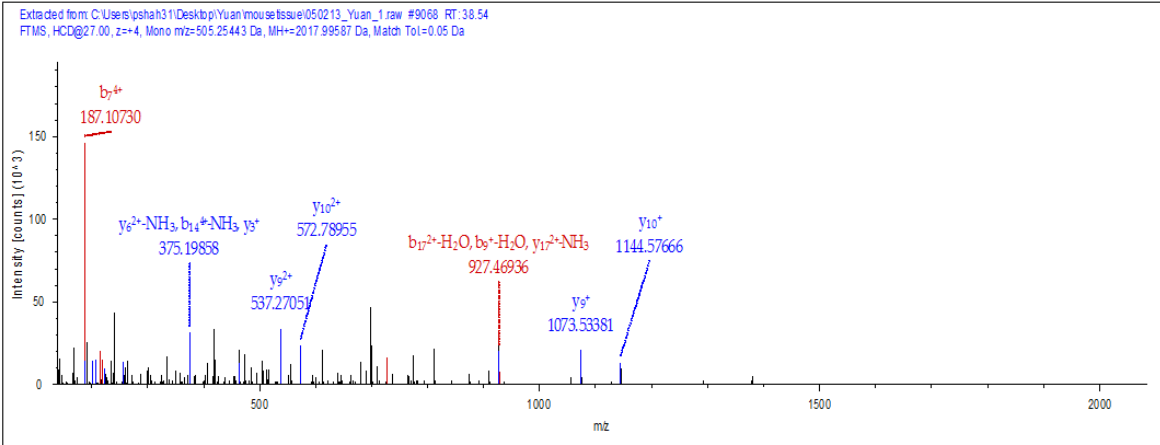


Macrophage galactose N-acetyl-galactosamine specific

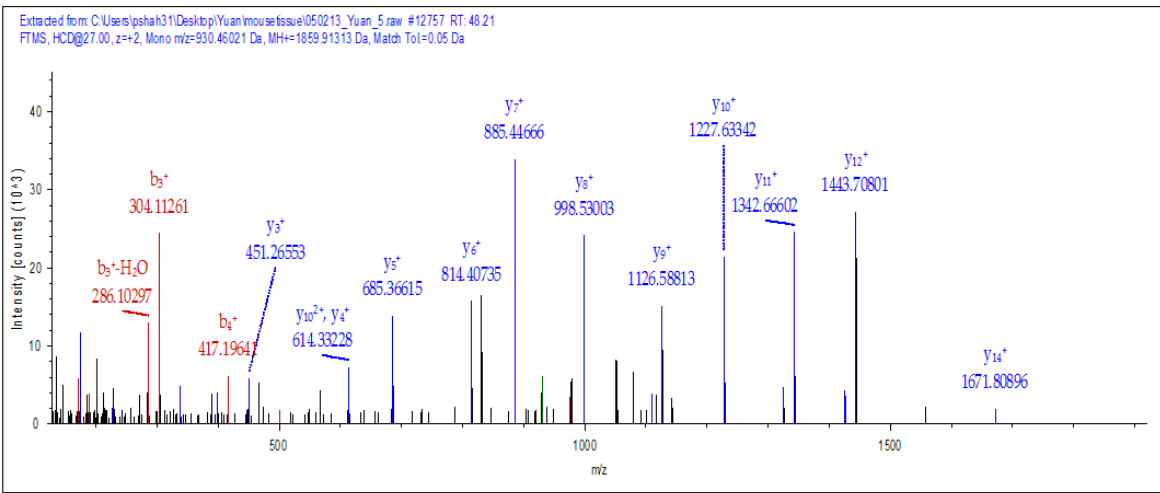
IPI00648264.4 lectin 1 ATLNTTTSK Deamidated(5) 2.71 2 476.234 951.460 18.66



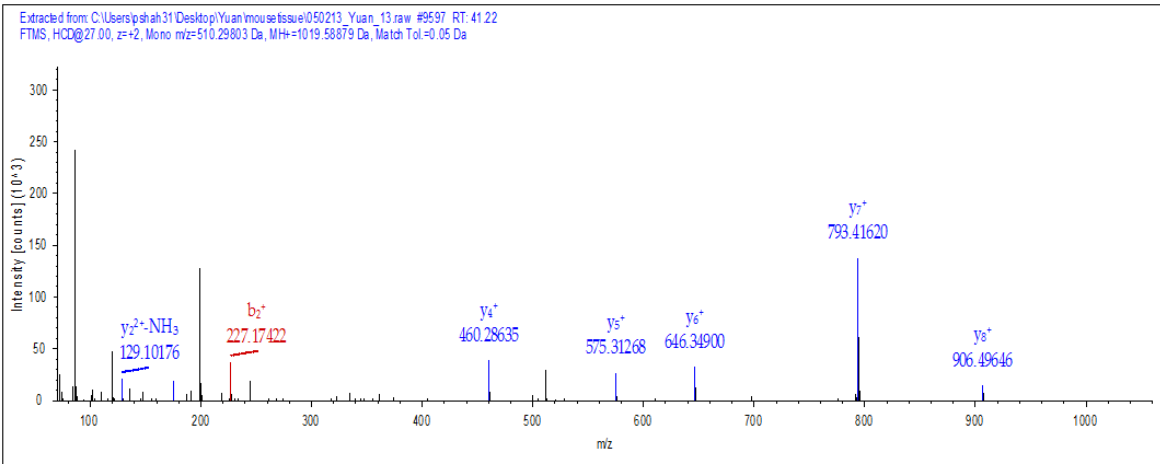
IPI00648426.1 Isoform 2 of Intraflagellar transport protein 20 homolog K MAKDILGEAGLHFDELN Deamidated(17)Oxidation(1) 3.18 4 505.255 2017.997 37.45



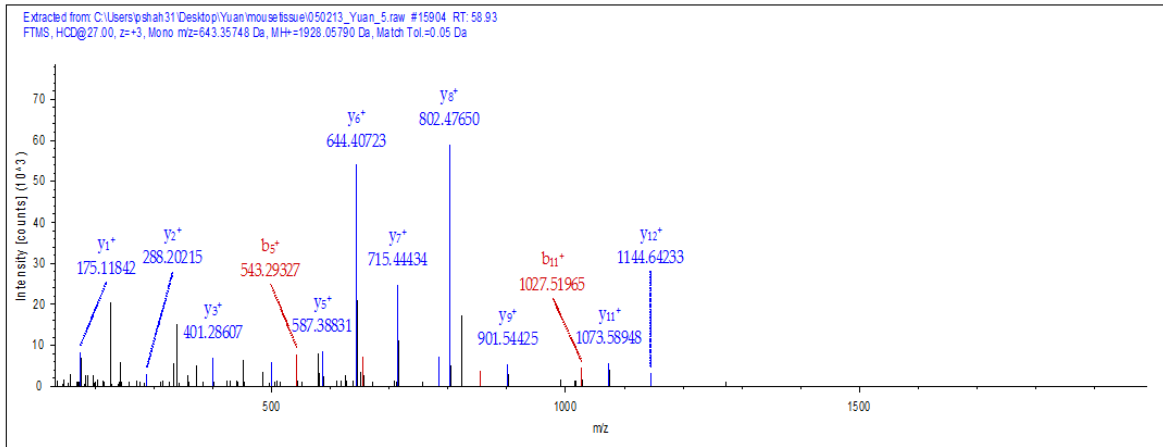
IPI00751342.1 Matrix metalloproteinase 9 TSNLTDQLAEAYLYR Deamidated(3) 4.82 2 930.460 1859.913 48.21



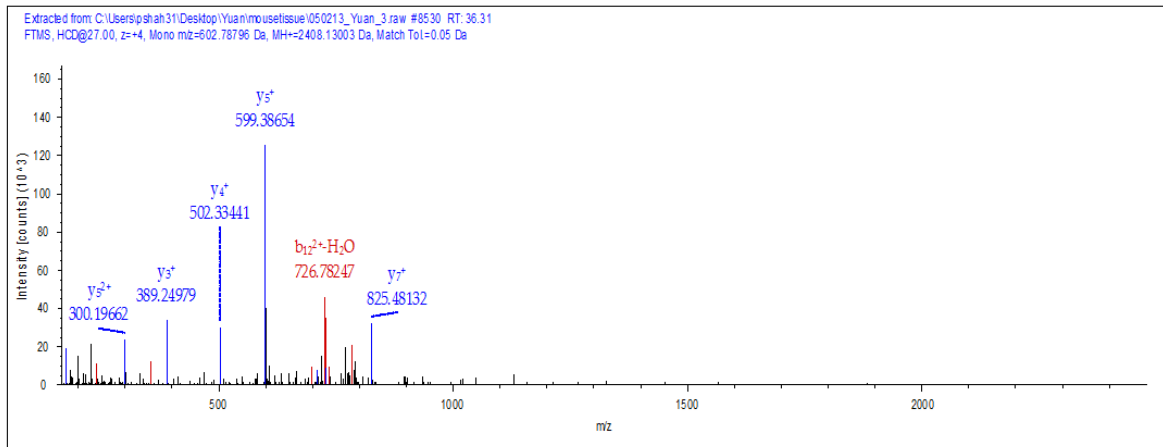
IPI00880438.1 Transmembrane 9 superfamily member 1 IIFANVSVR Deamidated(5) 2.43 2 510.298 1019.589 41.03



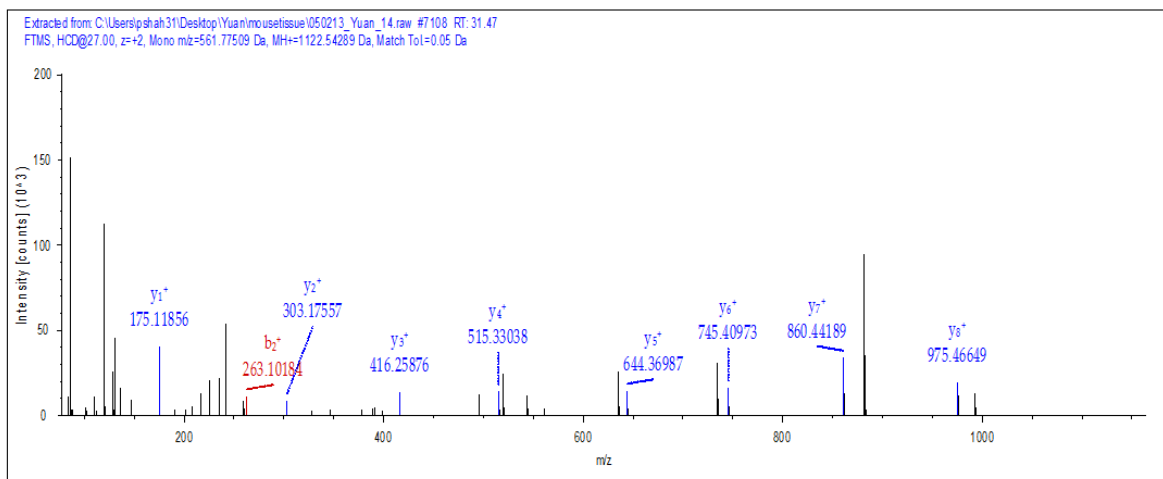
IPI00915512.1 S LLR Deamidated(11) 4.18 3 643.357 1928.058 58.93



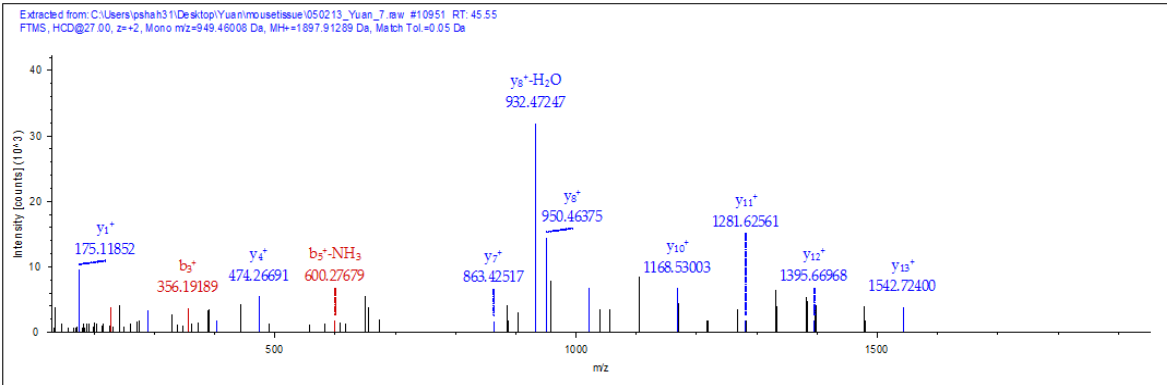
IPI00974634.1 locus 6 TLR 6)Deamidated(3) 3.35 4 602.788 2408.130 35.22



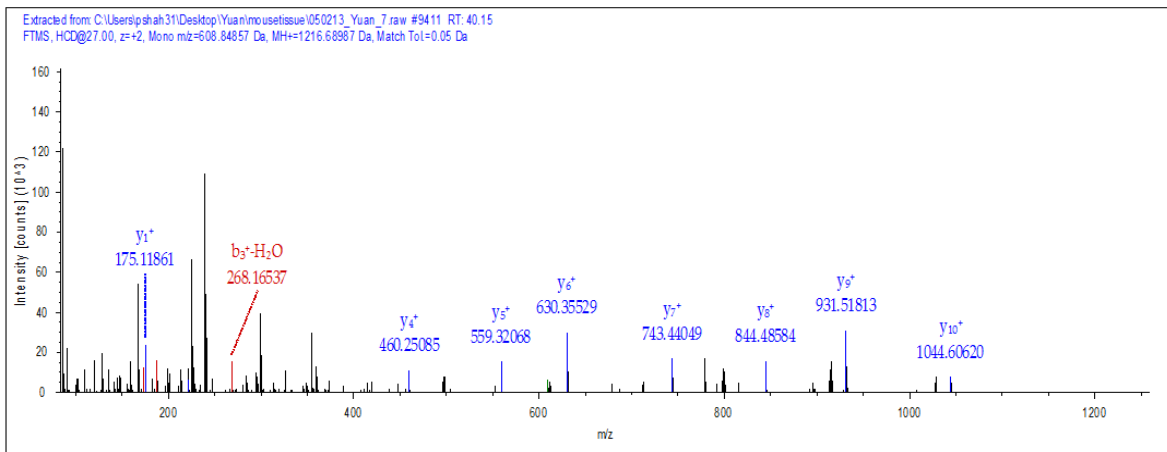
IPI00986446.1 Biotinidase FNDTEVLQR Deamidated(2) 2.44 2 561.775 1122.543 31.15



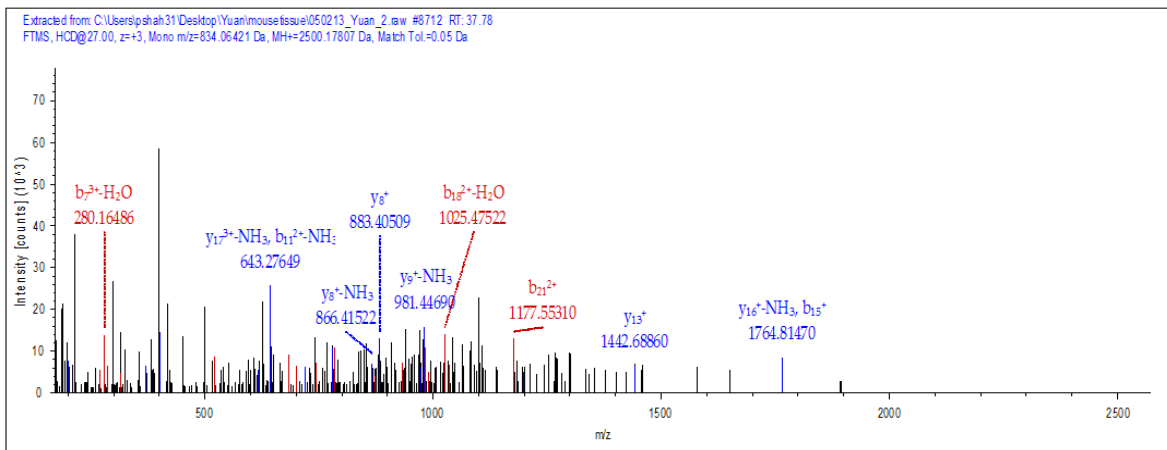
UDP-N-acetyl-alpha-D-galactosamine: polypeptide N-acetylglucosaminyltransferase 1
 Deamidated(15)Oxidation(7)
 IPI00987704.1 INQFNLMASEMIALNR (11) 2.51 2 949.460 1897.913 45.55



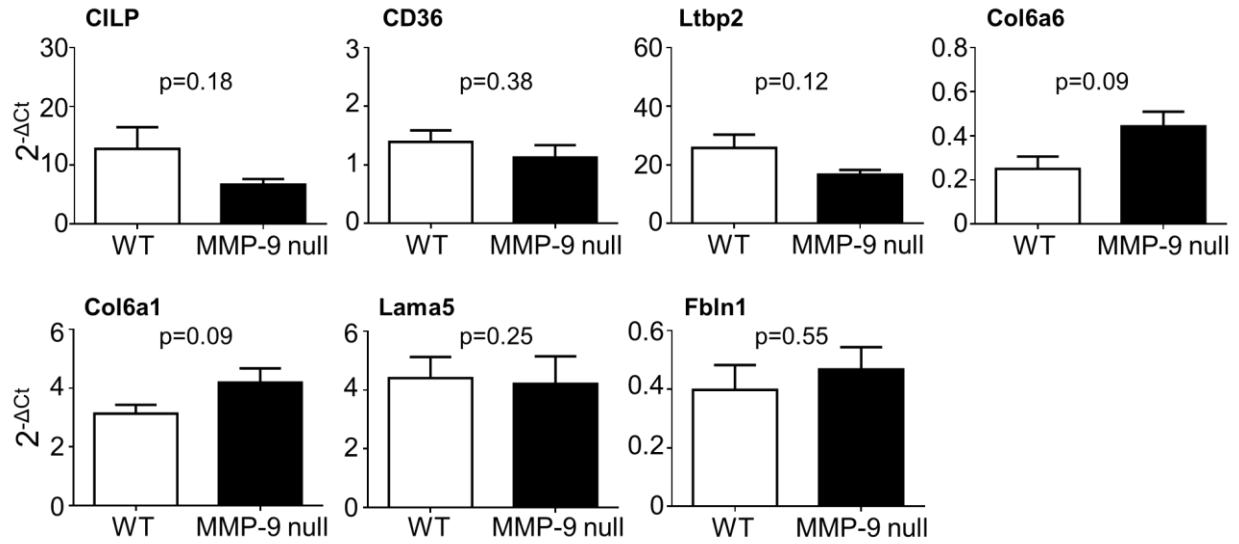
Chondroitin sulfate glucuronyltransferase
 IPI00988480.1 ATLSTLAVAVNR Deamidated(11) 2.62 2 608.849 1216.690 40.15



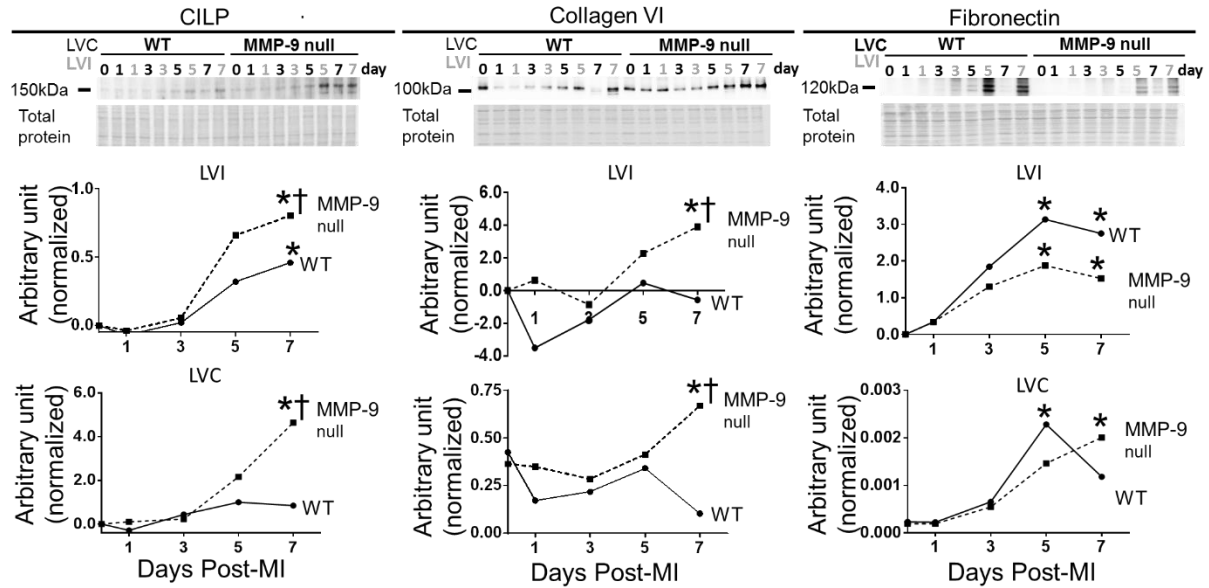
alpha-1-antitrypsin 1-6 isoform 2
 IPI01007946.1 GVKDLYHSDMISINFTDS SQAK Deamidated(14):C arbamyl 3.57 3 834.066 2500.183 38.52



Supplemental Figure S3. The annotated MS/MS spectra for the 24 single glycopeptides identified.



Supplemental Figure S4. RT-PCR analysis of the infarct (LVI) showed 7 of the top 12 proteins identified by glycoproteomics were not significantly different between WT and MMP-9 null. This highlights the importance of examining protein level changes in addition to gene level changes. Data are represented as mean \pm SEM. n=8/group.



Supplemental Figure S5. Immunoblotting of CILP, collagen VI, and fibronectin showed CILP expression increased in WT mice post-MI in both LVI and LVC. This increase was exacerbated by MMP-9 deletion. Collagen VI increased at day 7 post-MI in MMP-9 null mice only and fibronectin was higher in the WT group compared to MMP-9 null indicating these proteins are most likely not substrates of MMP-9. Data are represented as mean. * $p < 0.05$ vs D0; † $p < 0.05$ vs WT; Samples ($n=8$ /group) were pooled and run in triplicate.