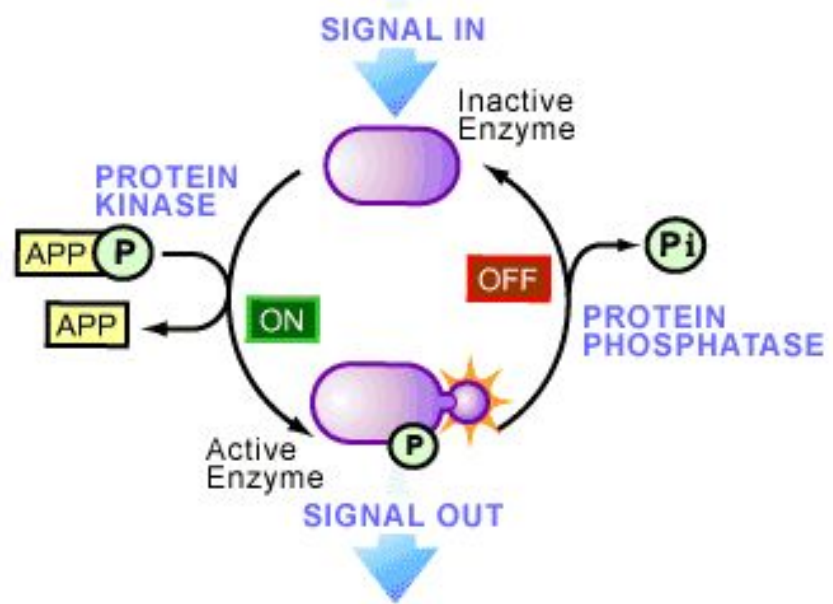


Cell Type Deconvolution by Phosphoproteomics

Bridget Li, Cameron Flower, Angela Ahn, Dr. Forest White

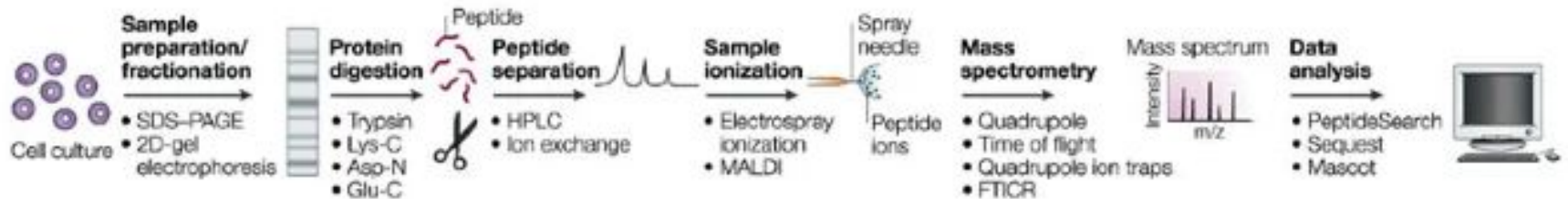
Background

- Signal transduction
- Protein phosphorylation
 - Kinases
 - Phosphatases
 - Adapter proteins
- Cancer



Background

- Phosphoproteomics
- Mass spectrometry



Project Overview

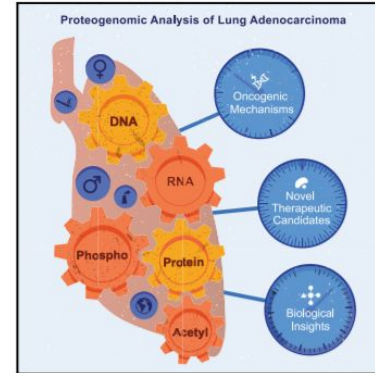
- Identify cell types in tumor tissue samples based on bulk phosphoproteomic data
- Data from a 2020 study in *Cell*
- Started by doing correlation analysis

Cell

Resource

Proteogenomic Characterization Reveals Therapeutic Vulnerabilities in Lung Adenocarcinoma

Graphical Abstract



Authors

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Correspondence

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In Brief

Comprehensive proteogenomic characterization of lung adenocarcinomas and paired normal adjacent tissues from patients of diverse smoking status and country of origin yields insights into cancer taxonomy, oncogenesis, and immune response; offers novel candidate biomarkers and therapeutic targets; and provides a community resource for further discovery.

Highlights

- Comprehensive LUAD proteogenomics exposes multi-omic clusters and immune subtypes
- Phosphoproteomics identifies candidate *ALK*-fusion diagnostic markers and targets
- Candidate drug targets: *PTPN11* (*EGFR*), *SOS1* (*KRAS*), neutrophil degranulation (*STK11*)
- Phospho and acetyl modifications denote tumor-specific markers and druggable proteins

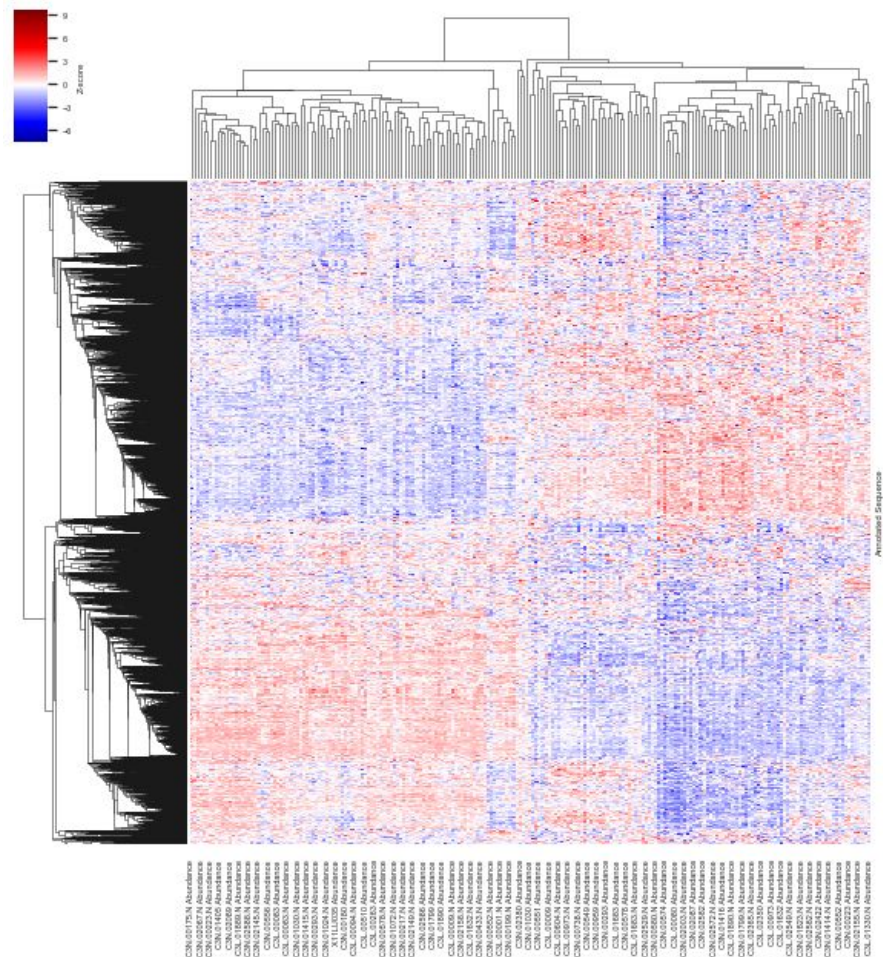


Gillette et al., 2020, Cell 182, 200–225
July 9, 2020 © 2020 Elsevier Inc.
<https://doi.org/10.1016/j.cell.2020.06.013>

CellPress

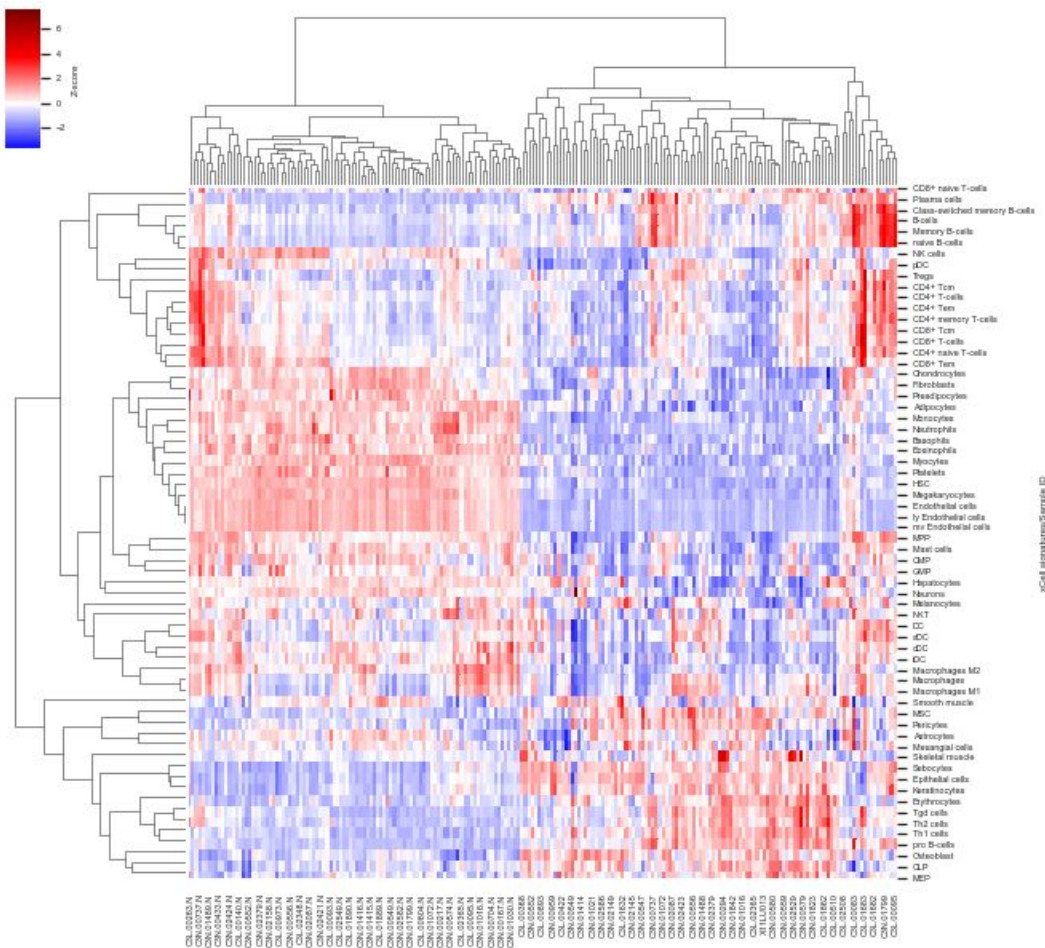
Phosphopeptide vs. Sample Heatmap

- 5256 peptides
- 211 samples

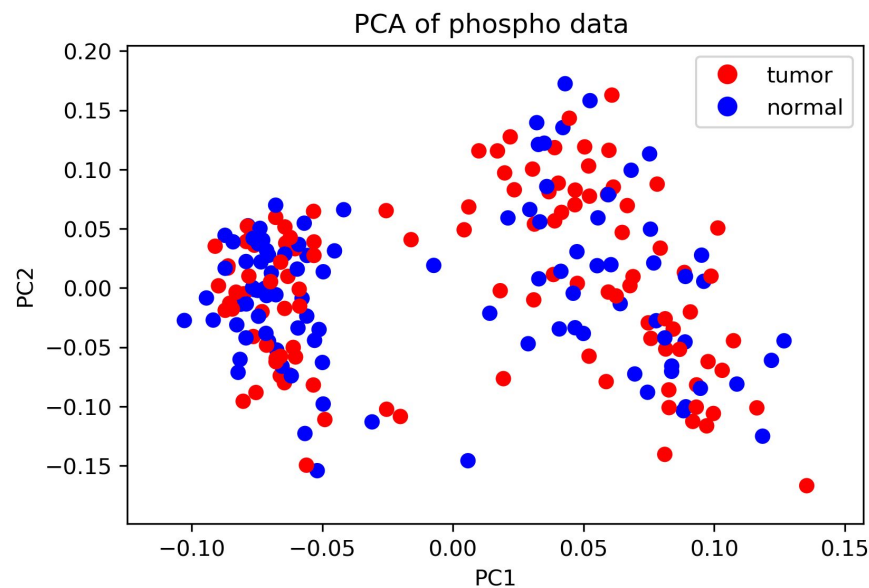
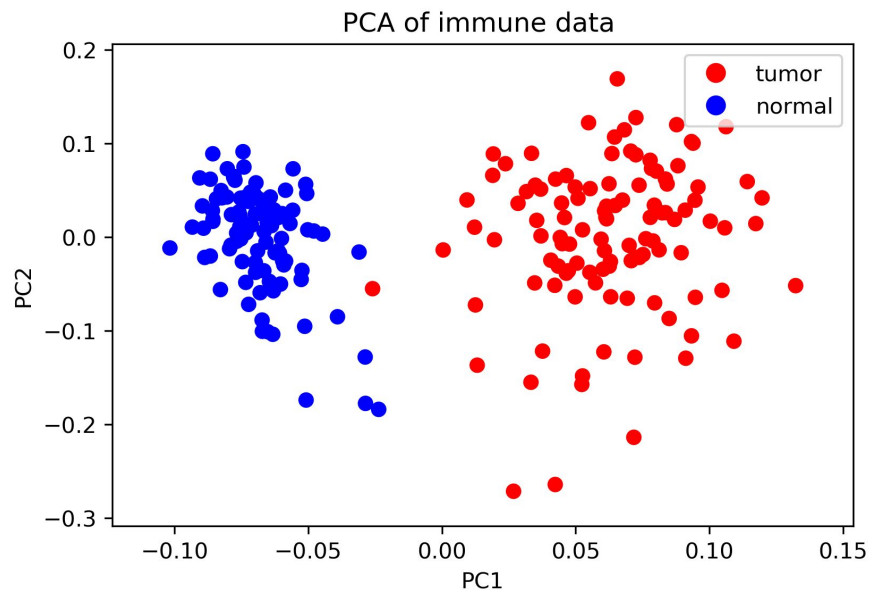


Immune Cell vs. Sample Heatmap

- 64 immune cells
- 211 samples

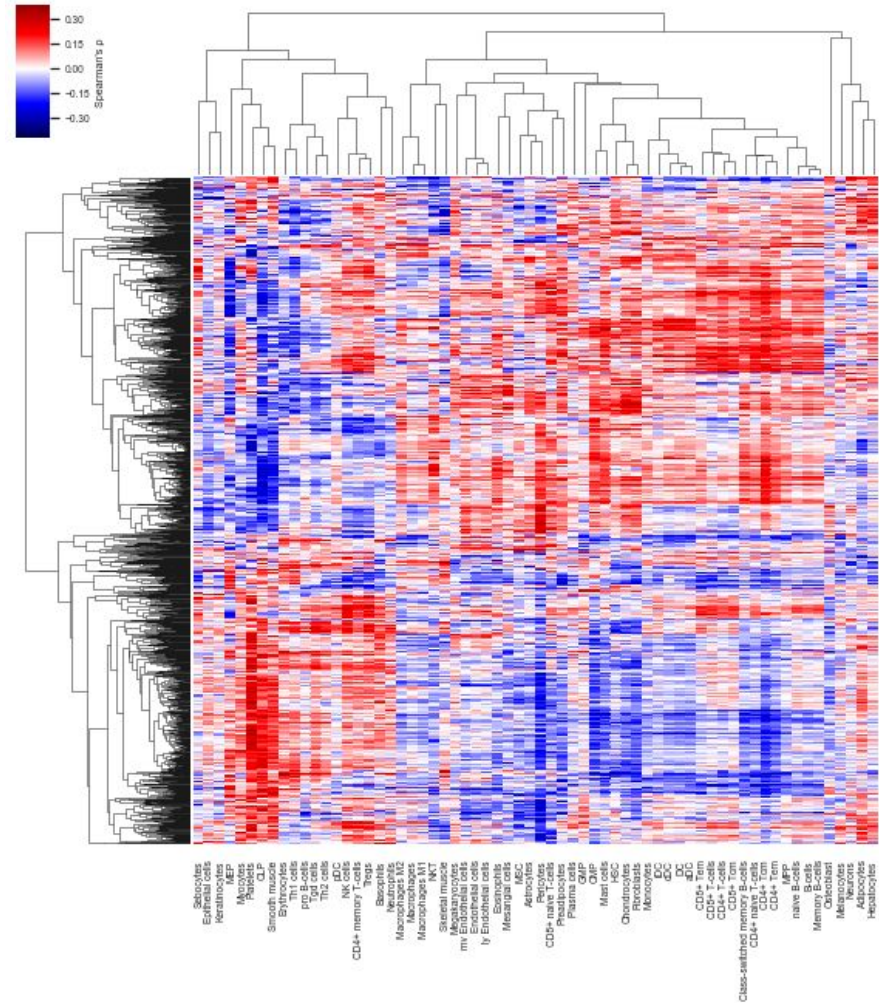


Principal Component Analysis (PCA)

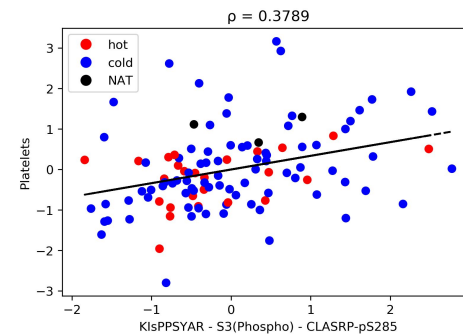
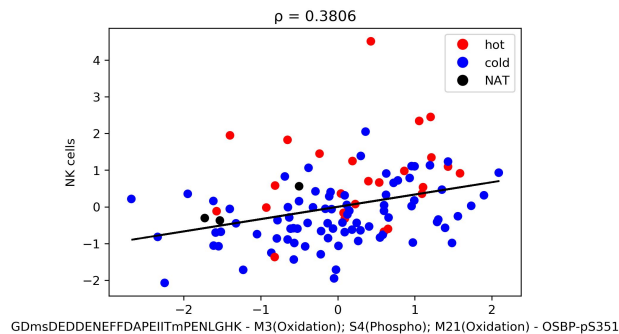
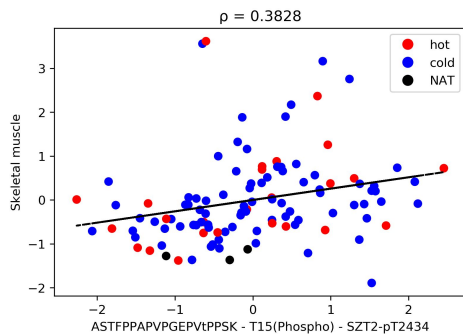
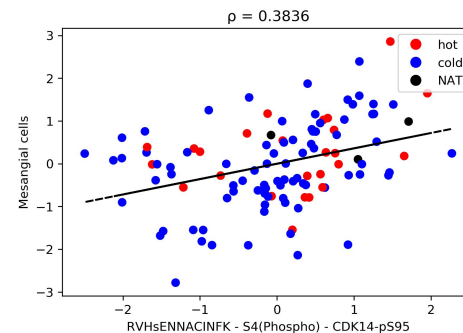
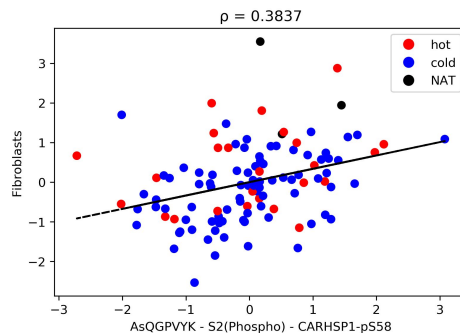
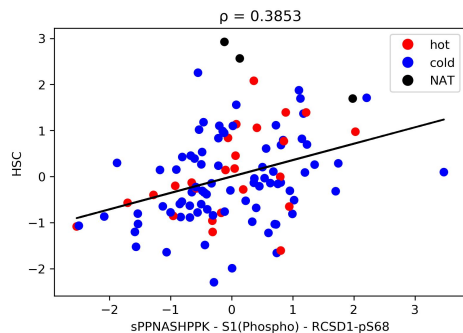


Phosphopeptide vs. Immune Cell Heatmap

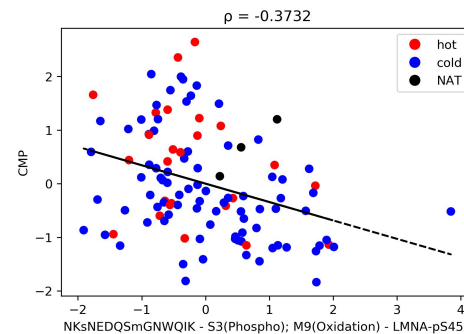
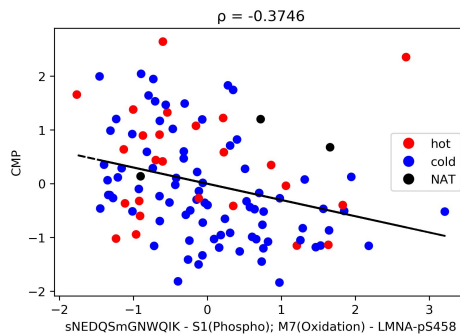
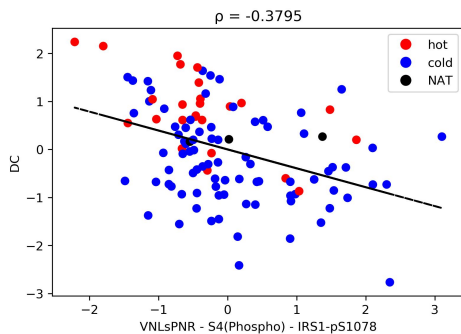
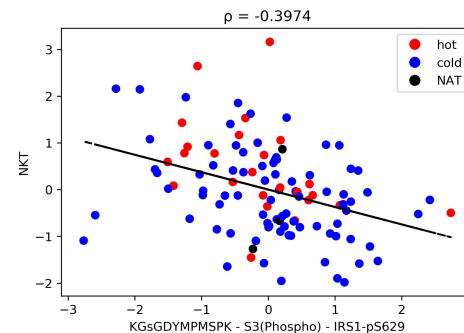
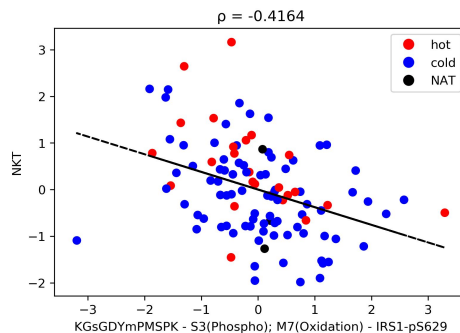
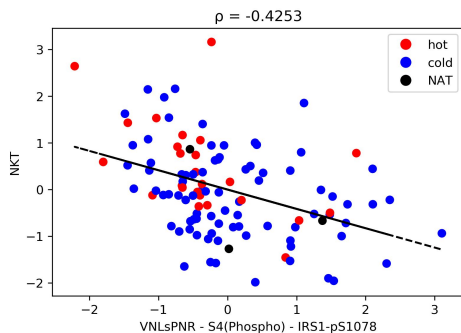
- 1584 peptides
- 64 immune cells



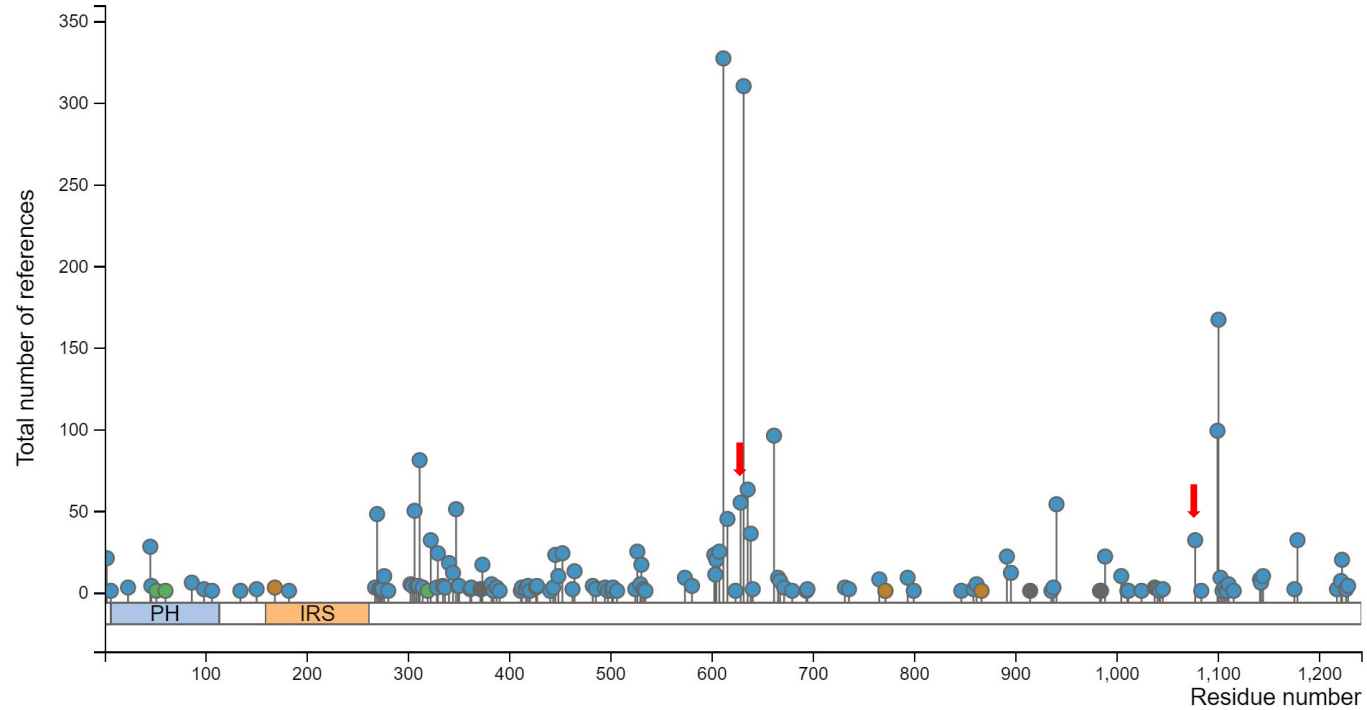
Most Correlated Peptides and Immune Cells



Least Correlated Peptides and Immune Cells



Insulin Receptor Substrate 1 (IRS1)



Future Work

- Biomarker analysis
 - Found matches between sample peptides and biomarkers
 - ['NES', 'VIM', 'NRP1', 'SPN', 'RORA', 'S100A9', 'NFKB1', 'STAT1', 'C5AR1', 'CD44', 'GP1BB', 'KIT', 'STAT3', 'RUNX1', 'ALDOC', 'PECAM1', 'PTPRC', 'AQP4', 'PEA15', 'ITGA4', 'FOXO1', 'NDRG2', 'MSR1', 'VPS54']
- Predictions based on signatures
- Other datasets

immune_cell

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A193 ALDOC

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	gene	Uniprot Protein	Aliases	localization	cells	cells.1	cells.2	cells.3	cells.4	cells.5	cells.6	cells.7	cells.8	cells.9	
2	AHR	P35869	Aryl hydro AHR BHLH	intracellular	LTI	Th2	NCR+ ILC3	NCR-ILC3	Th17						
3	ALDH1L1	O75891	Cytosolic 1 ALDH1L1	FTHFD	astrocyte										
4	ARG1	P05089	Arginase-1 ARG1		intracellular	m2c micro	macroph	ILC2							
5	AXL	P30530	Tyrosine-p AXL UFO		extracellular	tissue associated	Mac								
6	BACH2	O9BYV9	Transcript BACH2		intracellular	germinal center	B								
7	BATF	Q16520	Basic leuc BATF		intracellular	Tfh	Th2	Th2	Th17						
8	BATF3	O9NR55	Basic leuc BATF3	SN1	intracellular	classical D	Th17								
9	BTLA	Q27649	B- and T-ly BTLA		extracellular	follicular Th									
10	CCL1	P22362	C-C motif (CCL1) SCYA	secreted	M2a	M2b									
11	CCL11	P51671	Eotaxin (C-CCL11) SCY	secreted	M1	m1 microglia									
12	CCL14	Q16627	C-C motif (CCL14) NC	secreted	M2a										
13	CCL15	Q16663	C-C motif (CCL15) Mif	secreted	M1	m1 microglia									
14	CCL16	O15467	C-C motif (CCL16) IL18	secreted	M2c	m2c microglia									
15	CCL17	O92583	C-C motif (CCL17) SCY	secreted	M2a										
16	CCL18	P55774	C-C motif (CCL18) AM	secreted	M2a	m2c micro	M2c								
17	CCL19	O99731	C-C motif (CCL19) ELC	secreted	M1	m1 microglia									
18	CCL2	P13500	C-C motif (CCL2) MCP	secreted	M1	M2a	m1 microglia								
19	CCL20	P78556	C-C motif (CCL20) LAR	secreted	M1	M2b	m1 microglia								
20	CCL22	O00626	C-C motif (CCL22) MD	secreted	M2a										
21	CCL23	P55773	C-C motif (CCL23) Mif	secreted	M2a										
22	CCL24	O00175	C-C motif (CCL24) MP	secreted	M2a										
23	CCL26	O9Y258	C-C motif (CCL26) SCY	secreted	M2a										
24	CCL3	P10147	C-C motif (CCL3) GOS1	secreted	M1	m1 micro	effector CI	basophil	ILC1						
25	CCL4	P13236	C-C motif (CCL4) LAG3	secreted	M1	m1 micro	effector CD8	T							
26	CCL5	P13501	C-C motif (CCL5) D175	secreted	M1	m1 micro	M2d	effector CD8	T						
27	CCL8	P80075	C-C motif (CCL8) MCP	secreted	M1	m1 microglia									
28	CCR1	P32246	C-C chem CCR1	CMK	extracellular	Th1									
29	CCR10	P46092	C-C chem CCR10	GPI	extracellular	Th22									
30	CCR2	P41597	C-C chem CCR2	CMK	extracellular	M2c	classical monocyte								
31	CCR3	P51677	C-C chem CCR3	CMK	extracellular	basophil	eosinophil	Th2							
32	CCR4	P51679	C-C chem CCR4	CMK	extracellular	Th2	Th17	Th22							
33	CCR5	P51681	C-C chem CCR5	CMK	extracellular	Th1	macrophage	intermediate monocyte							
34	CCR6	P51684	C-C chem CCR6	CKR1	extracellular	Th17	Th22	LTI	NCR-ILC3						
35	CCR7	P32248	C-C chem CCR7	CMK	extracellular	classical D	LTI	naive CD8	T						
36	CCR8	P51685	C-C chem CCR8	CKR1	extracellular	Th2									
37	CCR9	P51686	C-C chem CCR9	GPR	extracellular	ILC2									
38	CD101	O93033	Immunogl CD101	EW	extracellular	Treg									
39	CD14	P08571	Monocyte CD14		extracellular	monocytic	intermedi	classical m	classical D	inflamm	macroph	neutrophil	tissue associated	Mac	
40	CD151	P48509	CD151 ant CD151	TSF	extracellular	platelet									
41	CD160	O95971	CD160 ant CD160	BY1	extracellular	NKT									
42	CD163	Q86V87	Scavenger CD163	M1	extracellular	m2a micro	macroph	M2a	M2c	classical m	m2c microglia				
43	CD164	Q04900	Slalomuc CD164		extracellular	stem cells									
44	CD177	Q8N6Q3	CD177 ant CD177	NB	extracellular	neutrophil									
45	CD180	O99467	CD180 ant CD180	LY6	extracellular	Marginal Zone	B								
46	CD19	P15391	B-lymphoc CD19		extracellular	B	Marginal	2	memory B	regulatory B					

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