Supplementary Figure 1. Flow cytometry panels used for BD Canto (A) and BD Fortessa (B).

Α

		Nome		Fluorochrome								
		Name	JD	AF488	PE	PerCp-Cy5.5	APC	PacBlue	PE-Cy7	APC-H7		
		Lympho*	1	CD56	CD8	CD16	CD3	CD45	CD19	CD4		
		T1*	2	CD4	CD38	HLA-DR	CD45RA	CCR7	CD3	CD8		
		T2	3	CD45	Tim-3	CD8	LAG3	CD3	PD-1	CD4		
Immune Analysis	ce	T2 iso	4	CD45	iso	CD8	iso	CD3	iso	CD4		
	Irfa	T3	5	CD4	Tim3	CD8	CD45RO	CD3	PD-1	CD45RA		
	SL	T4	6	CD11a	CD69	CD8	CXCR3	CD3	PD-1	CD4		
		Myelo*	7	CD45	CD66b	HLA-DR	CD33	CD14	CD123	CD16		
		Tumor*	8	CD45	PD-L2	CD66b	PD-L1	CD33	<u>EpCAM</u>	CD14		
		Tumor iso*	9	CD45	iso	CD66b	iso (PD-L1)	CD33	<u>EpCAM</u>	CD14		
	a	T1	10	CD45	CTLA-4	CD8	FOXP3	CD3	PD-1	CD4		
	nträ	T2	11	CD45	iso	CD8	FOXP3	CD3	iso	CD4		
		T3	12	CD45	Tim-3	CD8	FOXP3	CD3	Ki67	CD4		
Sorting			1	CD45	CD56	CD8	CD33	EpCAM	CD4	CD16		

Ab	FITC	PerCP Cy5.5	PE	PE- CF594	PE/Cy7	APC	Alexa 700	APC/ Cy7	BV421	BV510	BV605	BV711	BV780
Lymphocytes	IL-10	CD8	CXCR 5	CD56	CD25	FoxP3	CD3	L/D	PD-1	CD40L	Ki67	CD45	CD4
T cells	CD69	CD8	CD38	CCR7	CTLA-4	TIM-3	CD3	L/D	PD-1	CD45RA	CD45RO	CD45	CD4
Myeloid	CD16	CD33	PD-L2	CD163	CD83	PD-L1		L/D	HLA-DR	CD15	CD123	CD45	CD14
B cells	IL-10	CD21	CD38	CD27	CD19	PD-L1		L/D	HLA-DR	CD24	ΙgΜ	CD45	CD20

Supplementary Figure 2. PD-1/TIM-3 co-expression by CD8⁺ T cells (**A**) and CD4⁺ T cells (**B**) based on clinical features.





Supplementary Figure 3. Percent of PD-L1⁺ epithelial cells (EpCAM⁺) detected by flow correlates with the percent of PD-L1 in tumor cells by IHC (**A**). Both correlate with "hot" and "cold" cluster breakdown (**B**).







Supplementary Figure 4. Strong correlation between %PD-1 and %TIM-3 expression by both CD8⁺ T cells (**A**) and CD4⁺ T cells (**B**).



Supplementary Figure 5. Number of mutations detected by OncoPanel sequencing highly correlates with patient reported smoking status in pack-years.



Supplementary Figure 6. Significantly differentially regulated genes by Nanostring in "hot" versus "cold" immnuophenotypic clusters.

change elimit elimit P-value FDR Gene.sets ADA 2.08 1.48 2.61 2.334-07 0.000214 B-Cell Functions, T-Cell Functions G4RPA 4.45 -6.14 -2.76 2.04C-05 0.00538 Cell Functions, T-Cell Functions, Cytotoxicity FOS 2.33 -1.45 2.95K-05 0.00538 Cell Functions, Cytotoxicity TOLID -0.569 -0.807 -0.331 7.01E-05 0.00708 Complement CXCL10 2.46 1.42 3.5 8.48E-05 0.00708 Complement CXCL2 2.46 1.42 3.5 8.48E-05 0.00708 Complement CXCL2 2.46 1.43 3.7 0.00018 0.00977 CARIBP -0.859 -1.24 -0.475 0.000247 0.0115 Chemokines, Regulation, T-Cell Functions CYCR12 1.48 3.47 0.000247 0.0115 Chemokines, Regulation CCIL CXCL13 2.72 1.48 0.000247 0.0115 <td< th=""><th></th><th>Log2 fold</th><th>Lower confidenc</th><th>Upper confidenc</th><th></th><th></th><th></th></td<>		Log2 fold	Lower confidenc	Upper confidenc			
ADA 2.08 1.48 2.09 2.93(-07 0.000214 B:Cell Functions, T:Cell Functions CABPA 4.45 -6.14 -2.76 2.048-05 0.00538 Cell Functions, Cytotxicity FOS -2.38 -3.31 -1.45 2.958-05 0.00556 Chemokines, TMF Superfamily TOLLIP -0.569 -0.331 7.018-05 0.00708 Complement CXL10 2.44 -1.01 7.495-05 0.00708 Complement CXL10 2.47 -1.03 7.495-05 0.00708 Complement CXL10 2.49 1.41 3.57 0.00018 0.00725 Chemokines, Regulation, T-Cell Functions VEGEC 1.54 0.855 2.23 0.000213 0.0115 Chemokines CXL13 2.72 1.48 3.97 0.000228 0.0115 Chemokines CXL13 2.72 1.48 3.97 0.00028 0.0115 Chemokines CXL13 2.72 1.48 0.000284 0.0115 Chemokine		change	e limit	e limit	P-value	FDR	Gene.sets
C48PA 4.45 6.14 -2.76 2.04E-05 0.00538 Complement GZMB 1.57 0.959 2.17 2.57E-05 0.00538 Cell Functions, Cytotoxicity FOS -2.38 -3.31 -1.45 2.95E-05 0.00556 Chemokines, TMF Superfamily TOLLIP -0.847 -0.311 7.01E-05 0.00708 Complement CXCL1D 2.46 1.42 3.5 8.48E-05 0.00708 Chemokines, Pathogen Defense, Regulation, T-Cell Functions CXCL1 2.46 1.42 3.5 0.00108 0.00778 Chemokines, Regulation, T-Cell Functions CXCL1 2.46 1.42 3.57 0.000110 0.0077 CXCL13 2.72 1.48 3.97 0.000213 0.0115 Chemokines Chemokines CXCL13 2.72 1.48 3.97 0.000214 0.0115 Chemokines Chemokines CXCL13 3.6 0.212 0.000247 0.0115 Chemokines Chemokines TIT 1.36	ADA	2.08	1.48	2.69	2.93E-07	0.000214	B-Cell Functions, T-Cell Functions
GZMB 1.57 0.959 2.17 2.57E-05 0.00538 Cell Functions, Cytotoxicity FOS -2.38 -3.31 -1.45 2.95E-05 0.00538 Thrsf4 1.41 0.845 1.97 3.81E-05 0.00708 CMB -1.74 -2.47 -1.01 7.49E-05 0.00708 Complement CXCL10 2.46 1.42 3.57 5.48E-05 0.00708 Chemokines, Pathogen Defense, Regulation, T-Cell Functions CVCL10 2.44 1.41 3.57 0.000708 Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions VEGFC 1.54 0.855 0.223 0.00115 0.00977 CXCL13 2.72 1.48 3.97 0.000213 0.0115 Chemokines CTGAS 1.71 -2.5 0.9012 0.0115 Adhesion CTGH CTSH -1.71 -2.5 0.911 0.00028 0.0115 Chemokines, Regulation CTSH -1.71 -2.5 0.951 0.00044 0.0115 Chem	C4BPA	-4.45	-6.14	-2.76	2.04E-05	0.00538	Complement
FOS 2.38 -1.45 2.956.05 0.00338 TNFSF4 1.41 0.845 1.97 3.816.05 0.003556 Chemokines, TNF Superfamily TOLLP 0.569 -0.807 -0.31 7.016.05 0.00708 Complement CXCL10 2.46 1.42 3.5 8.486-05 0.00708 Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions CXCL10 2.49 1.41 3.57 0.000180 0.00785 Chemokines, Regulation, T-Cell Functions VEGC 1.54 0.855 2.23 0.00013 0.00177 CKL13 2.72 1.48 3.97 0.00021 0.0115 CREBBP 0.855 1.24 -0.475 0.00011 Otherokines, Regulation CTSH 1.71 -2.52 -0.915 0.000247 0.0115 Chemokines FOXI1 -3.43 5.05 -1.82 0.000240 0.0115 Chemokines, Regulation CTSH -1.71 -2.52 0.010 0.00244 0.0156 Sene	GZMB	1.57	0.959	2.17	2.57E-05	0.00538	Cell Functions, Cytotoxicity
TNFS4 1.41 0.2455 1.97 3.816-05 0.00056 Chemokines, TNF Superfamily TOLLIP -0.569 -0.807 -0.331 7.016-05 0.00708 Complement CXCL10 2.46 1.42 3.5 8.486-05 0.00708 Complement CXCL10 2.46 1.42 3.5 8.486-05 0.00708 Complement CXCL9 2.49 1.41 3.57 0.000168 0.00975 Chemokines, Regulation, T-Cell Functions VEGFC 1.54 0.855 2.23 0.000151 0.00977 CREBRP 0.8259 1.24 0.475 0.000121 0.0115 Chemokines, Regulation, T-Cell Functions VEGFC 1.71 -2.5 -0.915 0.000241 0.0115 Chemokines ITGA5 1.7 0.915 2.48 0.000241 0.0115 Cell Cycle FOX11 -3.43 5.05 1.82 0.000241 0.0115 Chemokines, TNF Superfamily FLA261B -3.13 -1.64 0.0	FOS	-2.38	-3.31	-1.45	2.95E-05	0.00538	
TOLLIP -0.569 -0.807 -0.331 7.01E-05 0.00708 CGB -1.74 -2.47 -1.01 7.49E-05 0.00708 Complement CXLL10 2.46 1.42 3.5 8.48E-05 0.00708 Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions VEGRC 1.54 0.855 2.23 0.000158 0.00977 CREBEP 0.45 0.855 2.23 0.000121 0.0115 Chemokines, Regulation, T-Cell Functions VEGRC 1.54 0.855 2.23 0.000228 0.0115 Chemokines CKL13 2.72 1.48 3.97 0.000247 0.0115 Chemokines CTSH 1.71 -2.5 0.915 0.000247 0.0115 Chemokines, Regulation CTL17 -3.15 1.24 0.000240 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 1.24 0.000318 0.0122 Chemokines FEGRL 1.68 -1.58 0.00045 0.0156	TNFSF4	1.41	0.845	1.97	3.81E-05	0.00556	Chemokines, TNF Superfamily
C88 -1.74 -2.47 -1.01 7.49E-05 0.00708 Complement CXCL10 2.46 1.42 3.5 8.48E-05 0.00708 Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions CXCL9 2.49 1.41 3.57 0.000158 0.00078 Chemokines, Regulation, T-Cell Functions CREBEP 0.4855 2.23 0.000151 0.00977 C CXL13 2.72 1.48 3.97 0.000213 0.0115 Chemokines CREBEP 0.035 2.48 0.0002247 0.0115 Chemokines Cell Cycle FOX1 -3.43 -5.05 -1.82 0.000247 0.0115 Cell Cycle FOX11 -3.43 -5.05 -1.82 0.000284 0.0115 Cell Cycle FOX11 -3.43 -5.05 -1.82 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 1.24 0.000248 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -	TOLLIP	-0.569	-0.807	-0.331	7.01E-05	0.00708	
CXCL10 2.46 1.42 3.5 8.48E-05 0.00708 Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions CXK19 2.49 1.41 3.57 0.000108 0.00785 Chemokines, Regulation, T-Cell Functions VEGFC 1.54 0.855 2.23 0.00018 0.00785 Chemokines, Regulation, T-Cell Functions CREBBP 0.859 1.24 -0.475 0.000213 0.0115 Chemokines CTGAS 1.7 0.915 2.48 0.000224 0.0115 Cell Cycle CTSH -1.71 -2.5 -0.915 0.000241 0.0115 Cell Cycle FOXII -3.43 -5.05 -1.82 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.42 0.000284 0.0115 Chemokines STAT1 1.36 0.723 2.01 0.000245 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -0.278 0.00045 0.0156 Macrophage Functions TIL6R </td <td>C8B</td> <td>-1.74</td> <td>-2.47</td> <td>-1.01</td> <td>7.49E-05</td> <td>0.00708</td> <td>Complement</td>	C8B	-1.74	-2.47	-1.01	7.49E-05	0.00708	Complement
CDK1 1.63 0.934 2.32 8.73E-05 0.00708 CXCL9 2.49 1.41 3.57 0.000130 0.00977 CREBBP 0.855 2.23 0.000130 0.00977 CXCL13 2.72 1.48 3.97 0.000213 0.0115 CREBBP 0.855 2.23 0.000228 0.0115 Chemokines TGA5 1.7 0.915 2.48 0.000224 0.0115 BIRC5 1.51 0.805 2.21 0.000284 0.0115 FOX1 -3.43 5.05 -1.82 0.000284 0.0122 Chemokines, Regulation CCL17 -2.75 -0.753 0.000484 0.0156 Senescence, T-Cell Functions TMFSF15 1.48 -2.2 -0.753 0.000450 0.0165 Macrophage Functions ILKR -1.11 -1.66 -0.553 0.00075 0.0206 Adhesion, Regulation TTK S17 0.28 0.272 Othemokines, Regulation TT 1.616	CXCL10	2.46	1.42	3.5	8.48E-05	0.00708	Chemokines, Cytokines, Pathogen Defense, Regulation, T-Cell Functions
CXCL9 2.49 1.41 3.57 0.00018 0.00785 Chemokines, Regulation, T-Cell Functions VEGFC 1.54 0.855 2.23 0.00011 0.00977 CREBBP 0.859 1.14 3.97 0.000213 0.0115 Chemokines ITGAS 1.7 0.915 2.48 0.000226 0.0115 Adhesion CTSH 1.71 -2.5 0.915 0.000247 0.0115 Cell Cycle FOX1 -3.43 -5.05 -1.82 0.000282 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000284 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 0.22 -0.753 0.00042 0.0156 Macrophage Functions IL6R -1.17 -0.35 0.000482 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0276<	CDK1	1.63	0.934	2.32	8.73E-05	0.00708	
VEGFC 1.54 0.855 2.23 0.000153 0.00977 CREBBP -0.859 -1.24 -0.475 0.000213 0.0115 Chemokines ITGA5 1.7 0.915 2.48 0.000213 0.0115 Adhesion CTSH -1.71 -2.5 -0.915 0.000247 0.0115 Cell Cycle FOXI1 -3.43 -5.05 -1.82 0.000282 0.0115 Statt STAT1 1.36 0.723 2.01 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.00038 0.0122 Chemokines, TNF Superfamily PIA2G18 -3.13 -4.68 -1.58 0.00444 0.0156 Chemokines, TNF Superfamily PIA2G18 -3.13 -4.68 -1.58 0.00045 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.00075 0.0206 Adhesion, Regulation TK 1.37 0.655 2.08 0.00022 O.2006 <td>CXCL9</td> <td>2.49</td> <td>1.41</td> <td>3.57</td> <td>0.000108</td> <td>0.00785</td> <td>Chemokines, Regulation, T-Cell Functions</td>	CXCL9	2.49	1.41	3.57	0.000108	0.00785	Chemokines, Regulation, T-Cell Functions
CREBBP -0.859 -1.24 -0.475 0.000161 0.00977 CXCL13 2.72 1.48 3.37 0.000218 0.0115 Chemokines ITGA5 1.7 0.915 2.48 0.000228 0.0115 Adhesion CTSH -1.71 -2.5 0.915 0.000228 0.0115 Cell Cycle FOX1 -3.43 -5.05 -1.82 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines EGR1 -1.87 -2.78 -0.951 0.000444 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -1.58 0.00045 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.2026 Adhesion, Regulation TK 1.37 0.655 2.08 0.00227 Chemokines, Regulation <	VEGFC	1.54	0.855	2.23	0.000153	0.00977	
CXCL13 2.72 1.48 3.97 0.000213 0.0115 Chemokines ITGA5 1.7 0.915 2.48 0.000228 0.0115 Adhesion CTSH -1.71 -2.5 -0.915 0.000247 0.0115 Cell Cycle FOXI1 -3.43 -5.05 -1.82 0.000284 0.0115 Cell Cycle FOXI1 -3.43 -5.05 -1.82 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines EGR1 -1.87 -2.78 -0.951 0.000442 0.0156 Chemokines, TNF Superfamily PLA2G18 -3.13 -4.68 -1.58 0.000519 0.0165 Macrophage Functions IL6R -1.14 -0.66 -0.553 0.00051 0.0257 Cytokines VCAM1 2.05 0.999 3.1 0.00075 0.026 Adhesion, Regulation TK 1.37 0.656 2.08 0.00127 <td>CREBBP</td> <td>-0.859</td> <td>-1.24</td> <td>-0.475</td> <td>0.000161</td> <td>0.00977</td> <td></td>	CREBBP	-0.859	-1.24	-0.475	0.000161	0.00977	
ITGAS 1.7 0.915 2.48 0.000228 0.0115 CTSH -1.71 -2.5 -0.915 0.000247 0.0115 BIRCS 1.51 0.805 2.21 0.000282 0.0115 STAT1 1.36 0.723 2.01 0.000282 0.0115 CL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000482 0.0156 Senescence, T-Cell Functions TNF5F15 -1.48 -2.22 -0.753 0.000482 0.0156 Chemokines, Regulation PRKCE -0.759 -1.14 -0.381 0.000482 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TK 1.37 0.656 2.08 0.000828 0.0232 Chemokines, Regulation <t< td=""><td>CXCL13</td><td>2.72</td><td>1.48</td><td>3.97</td><td>0.000213</td><td>0.0115</td><td>Chemokines</td></t<>	CXCL13	2.72	1.48	3.97	0.000213	0.0115	Chemokines
CTSH -1.71 -2.5 -0.915 0.000247 0.0115 BIRC5 1.51 0.805 2.21 0.000281 0.0115 FOX1 -3.43 -5.05 -1.82 0.000282 0.0115 CCL17 -2.37 -3.5 -1.24 0.000284 0.0115 CCL17 -2.37 -3.5 -1.24 0.00044 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -2.2 -0.73 0.00045 0.016 Regulation PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.00270 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 SIGIRR -0.11 -0.66 2.08 0.00272 Chemokines, Regulation TTK 1.37 0.656 2.08 0.00272 <td>ITGA5</td> <td>1.7</td> <td>0.915</td> <td>2.48</td> <td>0.000228</td> <td>0.0115</td> <td>Adhesion</td>	ITGA5	1.7	0.915	2.48	0.000228	0.0115	Adhesion
BIRC5 1.51 0.805 2.21 0.000261 0.0115 Cell Cycle FOXI1 -3.43 -5.05 -1.82 0.000282 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000284 0.0115 Chemokines EGR1 -1.87 -2.78 -0.951 0.00044 0.0156 Senescence, T-Cell Functions TNFSF15 -1.84 -2.2 -0.753 0.00042 0.0165 Mergulation PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions ILGR -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.00272 Chemokines, Regulation CL12 -1.55 -2.38 -0.723 0.00113 0.0276 ICL4 1.51 0.0125 0.028 Chemokines, Regulation <	СТЅН	-1.71	-2.5	-0.915	0.000247	0.0115	
FOX11 -3.43 -5.05 -1.82 0.000282 0.0115 STAT1 1.36 0.723 2.01 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines EGR1 -1.87 -2.78 -0.951 0.00045 0.0156 Chemokines, TNF Superfamily PLA2G1B -3.13 -4.68 -1.58 0.00045 0.0155 Macrophage Functions TNFSF15 -1.48 -2.2 -0.753 0.00045 0.0155 Macrophage Functions PLA2G1B -3.13 -4.68 -1.58 0.00075 0.0206 Adhesion, Regulation TK 1.37 0.656 2.08 0.00232 Start Clic -1.55 -0.464 0.00237 CD1C -1.55 -2.38 -0.723 0.0104 0.227 Chemokines, Regulation StGIRR 0.984 -1.25 -0.018 0.0272 Chemokines, Regulation CL14 -1.32 0.	BIRC5	1.51	0.805	2.21	0.000261	0.0115	Cell Cycle
STAT1 1.36 0.723 2.01 0.000284 0.0115 Chemokines, Regulation CCL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines EGR1 -1.87 -2.78 -0.951 0.00044 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -2.2 -0.753 0.00045 0.0156 Chemokines, TNF Superfamily PLA2G1B -3.13 -4.68 -1.58 0.00045 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00075 0.2026 Adhesion, Regulation TK 1.37 0.656 2.08 0.000257 Cell Functions CDLC -1.55 -0.464 0.00270 Chemokines, Regulation CL18 1.51 0.702 2.32 0.00108 0.0272 Chemokines, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation STAT6 -1.07 -1.65 -0.488 0.00127	FOXJ1	-3.43	-5.05	-1.82	0.000282	0.0115	
CCL17 -2.37 -3.5 -1.24 0.000318 0.0122 Chemokines EGR1 -1.87 -2.78 -0.951 0.000444 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -2.2 -0.753 0.00045 0.0156 Chemokines, TNF Superfamily PLA2G1B -3.13 -4.68 -1.58 0.000482 0.016 Regulation PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.026 Adhesion, Regulation TTK 1.37 0.656 2.08 0.00027 Chemokines, Regulation CL12 -1.55 -2.38 -0.723 0.0014 0.0271 T-Cell Functions CL4 1.51 0.702 2.32 0.00118 0.0279 Adhesion, Regulation STA16 -1.07 -1.65 0.488 <	STAT1	1.36	0.723	2.01	0.000284	0.0115	Chemokines, Regulation
EGR1 -1.87 -2.78 -0.951 0.000444 0.0156 Senescence, T-Cell Functions TNFSF15 -1.48 -2.2 -0.753 0.00045 0.0156 Chemokines, TNF Superfamily PLA2G1B -3.13 -4.68 -1.58 0.000482 0.016 Regulation PRCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.000705 0.0206 Adhesion, Regulation VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.00257 CD1C -1.55 -2.38 -0.723 0.0014 0.0271 T-Cell Functions CCL8 1.51 0.702 2.32 0.0018 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00118 0.0279 Adhesion, Regulation CL14 -1.07 -1.65 -0.488 0.00127 0.28	CCL17	-2.37	-3.5	-1.24	0.000318	0.0122	Chemokines
TNFSF15 -1.48 -2.2 -0.753 0.00045 0.0156 Chemokines, TNF Superfamily PLA2G1B -3.13 -4.68 -1.58 0.000422 0.016 Regulation PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.000282 0.0227 CD1C -1.55 -2.38 -0.723 0.00104 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Cell Cycle Cell Cycle C6 -2 -3.09 -0.0291 0.0281 Cell Cycle Cell Cycle <td>EGR1</td> <td>-1.87</td> <td>-2.78</td> <td>-0.951</td> <td>0.000444</td> <td>0.0156</td> <td>Senescence, T-Cell Functions</td>	EGR1	-1.87	-2.78	-0.951	0.000444	0.0156	Senescence, T-Cell Functions
PLA2G1B -3.13 -4.68 -1.58 0.000482 0.016 Regulation PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.000828 0.0232 SIGIRR -0.984 -1.5 -0.464 0.00951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 C	TNFSF15	-1.48	-2.2	-0.753	0.00045	0.0156	Chemokines, TNF Superfamily
PRKCE -0.759 -1.14 -0.381 0.000519 0.0165 Macrophage Functions IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.000828 0.0222 SIGIRR -0.984 -1.5 -0.464 0.000951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0271 T-Cell Functions CCL8 1.51 0.702 2.32 0.00108 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0118 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00127 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle ROR -2.32 -3.6 -1.05 0.00138 0.0281 Cell Cycle	PLA2G1B	-3.13	-4.68	-1.58	0.000482	0.016	Regulation
IL6R -1.11 -1.66 -0.553 0.00055 0.0167 Cytokines VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.00028 0.0232 SIGIRR -0.984 -1.5 -0.464 0.000951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.0138 0.0281 Cell Functions FCER1A	PRKCE	-0.759	-1.14	-0.381	0.000519	0.0165	Macrophage Functions
VCAM1 2.05 0.999 3.1 0.000705 0.0206 Adhesion, Regulation TTK 1.37 0.656 2.08 0.000828 0.0232 SIGIRR -0.984 -1.5 -0.464 0.00951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0271 T-Cell Functions CCL8 1.51 0.702 2.32 0.0018 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 IcAm4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98	IL6R	-1.11	-1.66	-0.553	0.00055	0.0167	Cytokines
TTK 1.37 0.656 2.08 0.000828 0.0232 SIGIRR -0.984 -1.5 -0.464 0.000951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0271 T-Cell Functions CL8 1.51 0.702 2.32 0.00108 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 0.899 0.00137 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0294 IL18 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions	VCAM1	2.05	0.999	3.1	0.000705	0.0206	Adhesion, Regulation
SIGIRR -0.984 -1.5 -0.464 0.00951 0.0257 CD1C -1.55 -2.38 -0.723 0.00104 0.0271 T-Cell Functions CCL8 1.51 0.702 2.32 0.00108 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.999 0.00137 0.0281 Complement NUP107 0.621 0.279 0.038 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00294 Ill18 1.02 0.451 1.59 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213	ттк	1.37	0.656	2.08	0.000828	0.0232	
CD1C -1.55 -2.38 -0.723 0.00104 0.0271 T-Cell Functions CCL8 1.51 0.702 2.32 0.00108 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.0018 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.0127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00160 0.0367 Pathogen Defense </td <td>SIGIRR</td> <td>-0.984</td> <td>-1.5</td> <td>-0.464</td> <td>0.000951</td> <td>0.0257</td> <td></td>	SIGIRR	-0.984	-1.5	-0.464	0.000951	0.0257	
CCL8 1.51 0.702 2.32 0.00108 0.0272 Chemokines, Regulation PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.00118 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 Ill18 1.02 0.451 1.59 0.00157 0.301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense	CD1C	-1.55	-2.38	-0.723	0.00104	0.0271	T-Cell Functions
PBK 1.32 0.611 2.04 0.00113 0.0276 ICAM4 -2.71 -4.18 -1.25 0.00118 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 Ill18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 </td <td>CCL8</td> <td>1.51</td> <td>0.702</td> <td>2.32</td> <td>0.00108</td> <td>0.0272</td> <td>Chemokines, Regulation</td>	CCL8	1.51	0.702	2.32	0.00108	0.0272	Chemokines, Regulation
ICAM4 -2.71 -4.18 -1.25 0.00118 0.0279 Adhesion, Regulation STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.844 0.00149 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34	РВК	1.32	0.611	2.04	0.00113	0.0276	· · ·
STAT6 -1.07 -1.65 -0.488 0.00125 0.028 Chemokines, Regulation, T-Cell Functions CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82	ICAM4	-2.71	-4.18	-1.25	0.00118	0.0279	Adhesion, Regulation
CCND3 -1.3 -2.01 -0.593 0.00127 0.028 Cell Cycle C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 Interleukins, T-Cell Functions IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23	STAT6	-1.07	-1.65	-0.488	0.00125	0.028	Chemokines, Regulation, T-Cell Functions
C6 -2 -3.09 -0.899 0.00137 0.0281 Complement NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	CCND3	-1.3	-2.01	-0.593	0.00127	0.028	Cell Cycle
NUP107 0.621 0.279 0.962 0.00138 0.0281 Cell Cycle RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	C6	-2	-3.09	-0.899	0.00137	0.0281	Complement
RORC -2.32 -3.6 -1.05 0.00138 0.0281 Cell Functions FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00255 0.0433 Cell Functions RRAD -2 -3.17 -0.82 0.00255 0.0456 Cell Functions	NUP107	0.621	0.279	0.962	0.00138	0.0281	Cell Cycle
FCER1A -1.98 -3.08 -0.884 0.00149 0.0294 IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	RORC	-2.32	-3.6	-1.05	0.00138	0.0281	Cell Functions
IL18 1.02 0.451 1.59 0.00157 0.0301 Interleukins, T-Cell Functions PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	FCER1A	-1.98	-3.08	-0.884	0.00149	0.0294	
PRG2 -1.16 -1.82 -0.497 0.00196 0.0367 Pathogen Defense FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	IL18	1.02	0.451	1.59	0.00157	0.0301	Interleukins, T-Cell Functions
FCGR3A 1.27 0.538 2.01 0.00213 0.0389 Regulation CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	PRG2	-1.16	-1.82	-0.497	0.00196	0.0367	Pathogen Defense
CCL23 -1.4 -2.21 -0.584 0.00231 0.041 Chemokines, Regulation COL3A1 3.23 1.34 5.12 0.00236 0.041 Regulation RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	FCGR3A	1.27	0.538	2.01	0.00213	0.0389	Regulation
COLDS Lit OlSSA O	((1)23	-1 A	-7 21	-0 584	0.00231	0.041	Chemokines Regulation
RRAD -2 -3.17 -0.82 0.00255 0.0433 Cell Functions REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions		2 22	1 3/	5 12	0.00231	0.041	Regulation
REPS1 0.567 0.23 0.904 0.00275 0.0456 Cell Functions	RRAD	-7	-3 17	-0.82	0.00255	0.0433	Cell Functions
	RFPS1	0.567	0.23	0.904	0.00275	0.0456	Cell Functions



Supplementary Figure 7. TLS size was accessed for quantification (**A**). Percent of CD19⁺ B cells defined by flow correlates with the Nanostring counts for CD19 gene expression (**B**) and B cell count by IHC (**C**). TLS score highly correlates with abundance of B cells quantified by flow (**D**) but not with "hot" or "cold" immunophenotype (**E**). Scale bars measuring TLS size to the tenth of a µm are overlayed onto image.



Supplementary Figure 8. No significant differences between Ig light chains between tumor B cells and normal lung B cells or between IL-10⁺ B cells and IL-10⁻ B cells.







Supplementary Figure 9. Immune parameters used for clustering in Figure 4.

	immune parameter
1	%EpCAM+ cells (live cells)
2	%CD45+ cells (live cells)
3	%CD3+ T cells (CD45+)
4	%CD19+ T cells (CD45+)
5	%CD56+ NK cells (CD45+)
6	%CD33+ monocytes (CD45+)
7	%CD66b+ granulocytes (CD45+)
8	%CD16+ NK cells
9	%CD8+ T cells (CD3+)
10	CD8/CD4 T cell ratio
11	%TIM-3+ (CD4+ T cells)
12	%PD-1+ (CD4+ T cells)
13	%TIM-3+ (CD8+ T cells)
14	%PD-1+ (CD8+ T cells)
15	%CD4+ T cells (CD3+)