

**Table S1.** Baseline demographic and clinical data for study participants. Biopsies obtained from the distal colon. Blood collection was within 2 days of biopsy collection, with the exception of HS12, where blood was collected 2 weeks after biopsy collection. CPI-checkpoint inhibitor; Combo-combination anti-CTLA-4 and anti-PD-1; SCLC-small cell lung cancer; TNF-tumor necrosis factor.

ID	Disease	Age	Sex	CPI	CPI response	Cancer	Prior immunosuppression	CPI colitis onset (weeks)	Grade colitis	Endoscopic severity	Histologic features	CPI colitis responded to:
HS1	HC	50-55	M	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
HS2	HC	60-65	M	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
HS3	HC	50-55	F	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
HS4	UC	30-35	F	N/A	N/A	N/A	anti-TNF	N/A	N/A	0	No significant pathologic abnormality	N/A
HS5	UC	25-30	F	N/A	N/A	N/A	anti-TNF	N/A	N/A	0	cryptitis and crypt abscess formation, consistent with active colitis	N/A
HS6	UC	50-55	M	N/A	N/A	N/A	anti-TNF	N/A	N/A	2	cryptitis, crypt abscess formation, ulceration, mild crypt architectural distortion, Paneth cell metaplasia	N/A
HS7	CPI Colitis	70-75	M	anti-PD-1	nonresponse	Prostate	None	48	Grade 1	1	lymphocytic colitis, stromal neutrophils, cryptitis	Budesonide
HS8	CPI Colitis	80-85	M	anti-PD-1	response	HNSCC	Corticosteroid	55	Grade 1	1	active proctitis and colitis	Increased corticosteroid
HS9	CPI Colitis	55-60	F	anti-PD-1	response (adjuvant)	Melanoma	Corticosteroid	16	Grade 2	2	active colitis, prominent cryptitis and	anti-TNF and corticosteroid

											crypt abscesses	
HS10	CPI Colitis	70-75	F	anti-PD-1	response	Merkel cell carcinoma	Corticosteroid, anti-TNF (8 doses), anti-a4B7 (9 doses)	2	Grade 2	1	cryptitis and crypt abscess formation, prominent epithelial apoptosis and crypt atrophy	2nd anti-TNF and corticosteroid
HS11	CPI Colitis	55-60	M	anti-PD-1	response	Melanoma	Corticosteroid, anti-TNF (3 doses)	44	Grade 2/3	1	cryptitis, crypt abscess formation, Paneth cell metaplasia, consistent with chronic active colitis	anti-a4B7
HS12	CPI Colitis	50-55	F	anti-PD-1	response (adjuvant)	Melanoma	Corticosteroid, anti-TNF (1 dose)	11	Grade 2	0	cryptitis with focal acute inflammation in the lamina propria and increased intraepithelial lymphocytosis	anti-a4B7
HS13	CPI Colitis	70-75	F	Combo	nonresponse	SCLC Lung	Corticosteroid	6	Grade 3	0	cryptitis and crypt abscess formation, consistent with active colitis	Increased corticosteroid
HS14	CPI Colitis	60-65	M	Combo	nonresponse	Renal cell carcinoma	Corticosteroid	6	Grade 3	3	cryptitis, crypt abscesses, crypt loss/atrophy	anti-TNF and corticosteroid
HS15	CPI Colitis	65-70	M	Combo	nonresponse	Renal cell carcinoma	Corticosteroid	4	Grade 3	1	cryptitis with crypt abscesses, focal crypt atrophy	anti-TNF and corticosteroid

**Table S2. Antibody panels for CITEseq (TotalSeq-C, top), and mass cytometry (CyTOF, bottom).**

Assay	Target (anti-human unless specified)	Ion channel/DNA barcode	Metal/DNA ID	Clone	H5AD symbol	Vendor
CITEseq	B7-H4	TGTATGTCTGCCTTG	C0395	MIH43	B7-H4	BioLegend
	CD10	CAGCCATTCATTAGG	C0062	HI10a	CD10	BioLegend
	CD101 (BB27)	CTACTTCCCTGTCAA	C0944	BB27	CD101--BB27	BioLegend
	CD103 (Integrin alpha E)	GACCTCATTGTGAAT	C0145	Ber-ACT8	CD103	BioLegend
	CD105	ATCGTCGAGAGCTAG	C0068	43A3	CD105--ENG	BioLegend
	CD106	TCACAGTTCCTTGGA	C0245	STA	CD106	BioLegend
	CD107a (LAMP-1)	CAGCCCACTGCAATA	C0155	H4A3	CD107a--LAMP-1	BioLegend
	CD112 (Nectin-2)	AACCTTCCGTCTAAG	C0024	TX31	CD112--Nectin-2	BioLegend
	CD117 (c-kit)	AGACTAATAGCTGAC	C0061	104D2	CD117--c-kit	BioLegend
	CD119 (IFN-gamma R alpha chain)	TGTGTATTCCTTGT	C0219	GIR-208	CD119--IFNGR1	BioLegend
	CD11a	TATATCCTTGTGAGC	C0185	TS2/4	CD11a	BioLegend
	CD11b	GACAAGTGATCTGCA	C0161	ICRF44	CD11b	BioLegend
	CD11c	TACGCCTATAACTTG	C0053	S-HCL-3	CD11c	BioLegend
	CD122 (IL-2R beta)	TCATTTCTCCGATT	C0246	TU27	CD122--IL-2R-B	BioLegend
	CD123	CTTCACTCTGTCAGG	C0064	6H6	CD123	BioLegend
	CD124 (IL-4R alpha)	CCGTCCTGATAGATG	C0363	G077F6	CD124--IL-4R-A	BioLegend
	CD127 (IL-7R alpha)	GTGTGTTGTCCTATG	C0390	A019D5	CD127--IL-7Ra	BioLegend
	CD13	TTTCAACGCCCTTTC	C0364	WM15	CD13	BioLegend
	CD134 (OX40)	AACCCACCGTTGTTA	C0158	Ber-ACT35 (ACT35)	CD134--OX40	BioLegend
	CD137 (4-1BB)	CAGTAAGTTCGGGAC	C0355	4B4-1	CD137--4-1BB	BioLegend
	CD137L (4-1BB Ligand)	ATTCGCCTTACGCAA	C0022	5F4	CD137L--4-1BB-Ligand	BioLegend
	CD14	TCTCAGACCTCCGTA	C0081	M5E2	CD14.1	BioLegend
	CD140a (PDGFR alpha)	ATGCGCCGAGAATTA	C0128	16A1	CD140a--PDGFRA	BioLegend
	CD140b (PDGFR?)	CAATGGTTCACTGCC	C0129	18A2	CD140b--PDGFRB	BioLegend
	CD141 (Thrombomodulin)	GGATAACCGCGCTTT	C0163	M80	CD141--Thrombomodulin	BioLegend

CD144 (VE-Cadherin)	TCCACTCATTCTGTA	C0400	BV9	CD144--VE-cadherin	BioLegend
CD146	CCTTGGATAACATCA	C0134	P1H12	CD146	BioLegend
CD150 (SLAM)	GTCATTGTATGTCTG	C0870	A12 (7D4)	CD150--SLAM	BioLegend
CD152 (CTLA-4)	ATGGTTCACGTAATC	C0151	BNI3	CD152--CTLA-4	BioLegend
CD154	GCTAGATAGATGCAA	C0032	24-31	CD154	BioLegend
CD155 (PVR)	ATCACATCGTTGCCA	C0023	SKII.4	CD155--PVR	BioLegend
CD158 (KIR2DL1/S1/S3/S5)	TATCAACCAACGCTT	C0420	HP-MA4	CD158	BioLegend
CD158b (KIR2DL2/L3, NKAT2)	GACCCGAGTTTGAT	C0592	DX27	CD158b--KIR2DL2--KIR2DL3--NKAT2	BioLegend
CD158e1 (KIR3DL1, NKB1)	GGACGCTTTCCTTGA	C0599	DX9	CD158e1--KIR3DL1--NKB1	BioLegend
CD158f (KIR2DL5)	AAAGTGATGCCACTG	C0600	UP-R1	CD158f--KIR2DL5	BioLegend
CD16	AAGTTCACTCTTTGC	C0083	3G8	CD16	BioLegend
CD161	GTACGCAGTCCTTCT	C0149	HP-3G10	CD161	BioLegend
CD163	GCTTCTCCTTCTTA	C0358	GHI/61	CD163.1	BioLegend
CD169 (Sialoadhesin, Siglec-1)	TACTCAGCGTGTTTG	C0206	7-239	CD169--Sialoadhesin--Siglec-1	BioLegend
CD178 (Fas-L)	CCGGTCCTCTGTATT	C0177	NOK-1	CD178--Fas-L	BioLegend
CD18	TATTGGGACACTTCT	C0385	TS1/18	CD18	BioLegend
CD183 (CXCR3)	GCGATGGTAGATTAT	C0140	G025H7	CD183 (CXCR3)	BioLegend
CD184 (CXCR4)	TCAGGTCCTTTCAAC	C0366	12G5	CD184 (CXCR4)	BioLegend
CD185 (CXCR5)	AATTCAACCGTCGCC	C0144	J252D4	CD185 (CXCR5)	BioLegend
CD19	CTGGGCAATTACTCG	C0050	HIB19	CD19.1	BioLegend
CD194 (CCR4)	AGCTTACCTGCACGA	C0071	L291H4	CD194--CCR4	BioLegend
CD195 (CCR5)	CCAAAGTAAGAGCCA	C0141	J418F1	CD195--CCR5	BioLegend
CD196 (CCR6)	GATCCCTTTGTCACT	C0143	G034E3	CD196--CCR6	BioLegend
CD197 (CCR7)	AGTTCAGTCAACCGA	C0148	G043H7	CD197--CCR7	BioLegend
CD1a	GATCGTGTGTGTTA	C0402	HI149	CD1a	BioLegend
CD1c	GAGCTACTTCACTCG	C0160	L161	CD1c	BioLegend
CD1d	TCGAGTCGCTTATCA	C0164	51.1	CD1d	BioLegend
CD2	TACGATTTGTCAGGG	C0367	TS1/8	CD2.1	BioLegend
CD20	TTCTGGGTCCCTAGA	C0100	2H7	CD20	BioLegend

CD201 (EPCR)	GTTTCCTTGACCAAG	C0069	RCR-401	CD201--EPCR	BioLegend
CD204	TAGCGAGCCAGATGT	C0399	7C9C20	CD204	BioLegend
CD206 (MMR)	TCAGAACGTCTAACT	C0205	15-2	CD206--MMR	BioLegend
anti-mouse/human CD207	CGATTTGTATTCCCT	C0437	4C7	CD207--Langerin	BioLegend
CD209 (DC-SIGN)	TCACTGGACACTTAA	C0597	9E9A8	CD209--DC-SIGN	BioLegend
CD21	AACCTAGTAGTTCGG	C0181	Bu32	CD21	BioLegend
CD22	GGGTTGTTGTCTTTG	C0393	S-HCL-1	CD22.1	BioLegend
CD223 (LAG-3)	CATTGTCTGCCGGT	C0152	11C3C65	CD223--LAG-3	BioLegend
CD224	CTGATGAGATGTCAG	C1052	KF29	CD224	BioLegend
CD226 (DNAM-1)	TCTCAGTGTGTTGTGG	C0368	11A8	CD226--DNAM-1	BioLegend
CD23	TCTGTATAACCGTCT	C0897	EBVCS-5	CD23	BioLegend
CD235ab	GCTCCTTACACGTA	C0196	HIR2	CD235ab	BioLegend
CD24	AGATTCCTTCGTGTT	C0180	ML5	CD24.1	BioLegend
CD244 (2B4)	TCGCTTGGATGGTAG	C0189	C1.7	CD244--2B4	BioLegend
CD25	TTTGTCTGTACGCC	C0085	BC96	CD25	BioLegend
CD252 (OX40L)	TTTAGTGATCCGACT	C0021	11C3.1	CD252--OX40L	BioLegend
CD254 (TRANCE, RANKL)	TCCGTGTTAGTTTGT	C0356	MIH24	CD254--TRANCE--RANKL	BioLegend
CD257 (BAFF, BLYS)	CAGAGCACCCATTAA	C0863	1D6	CD257--BAFF--BLYS	BioLegend
CD258 (LIGHT)	ACTTCCCTGTAGAAA	C1056	T5-39	CD258--LIGHT	BioLegend
CD26	GGTGGCTAGATAATG	C0396	BA5b	CD26	BioLegend
CD267 (TACI)	AGTGATGGAGCGAAC	C0247	1A1	CD267--TACI	BioLegend
CD268 (BAFF-R)	CGAAGTCGATCCGTA	C0215	11C1	CD268--BAFF-R	BioLegend
CD269 (BCMA)	CAGATGATCCACCAT	C0056	19F2	CD269--BCMA	BioLegend
CD27	GCACTCCTGCATGTA	C0154	O323	CD27.1	BioLegend
CD270 (HVEM, TR2)	TGATAGAAACAGACC	C0020	122	CD270--HVEM--TR2	BioLegend
CD272 (BTLA)	GTTATTGGACTAAGG	C0170	MIH26	CD272--BTLA	BioLegend
CD273 (B7-DC, PD-L2)	TCAACGCTTGGCTAG	C0008	24F.10C12	CD273--B7-DC--PD-L2	BioLegend
CD274 (B7-H1, PD-L1)	GTTGTCCGACAATAC	C0007	29E.2A3	CD274--B7-H1--PD-L1	BioLegend
CD275 (B7-H2, ICOSL)	GTGCATTCAACAGTA	C0009	2D3	CD275--B7-H2--ICOSL	BioLegend

anti-human/mouse/rat CD278 (ICOS)	CGCGCACCCATTAAA	C0171	C398.4A	CD278--ICOS	BioLegend
CD279	ACAGCGCCGTATTTA	C0088	EH12.2H7	CD279--PD-1	BioLegend
CD28	TGAGAACGACCCTAA	C0386	CD28.2	CD28.1	BioLegend
CD29	GTATTCCTCAGTCA	C0369	TS2/16	CD29	BioLegend
CD294 (CRTH2)	TGTTTACGAGAGCCC	C0102	BM16	CD294--CRTH2	BioLegend
CD3	CTCATTGTAACCTCT	C0034	UCHT1	CD3	BioLegend
CD30	TCAGGGTGTGCTGTA	C0028	BY88	CD30	BioLegend
CD303 (BDCA-2)	GAGATGTCCGAATTT	C0370	201A	CD303--BDCA-2	BioLegend
CD304 (Neuropilin-1)	GGACTAAGTTTCGTT	C0406	12C2	CD304--Neuropilin-1	BioLegend
CD305 (LAIR1)	ATTTCCATTCCCTGT	C0590	NKTA255	CD305--LAIR1	BioLegend
CD307d (FcRL4)	CGATTTGATCTGCCT	C0828	413D12	CD307d--FcRL4	BioLegend
CD307e (FcRL5)	TCACGCAGTCCTCAA	C0829	509f6	CD307e--FcRL5	BioLegend
CD31	ACCTTTATGCCACGG	C0124	WM59	CD31	BioLegend
CD314 (NKG2D)	CGTGTTTGTTCCTCA	C0165	1D11	CD314--NKG2D	BioLegend
CD319 (CRACC)	AGTATGCCATGTCTT	C0830	162.1	CD319--CRACC	BioLegend
CD32	GCTTCCGAATTACCG	C0142	FUN-2	CD32	BioLegend
CD324 (E-Cadherin)	ATCCTTCTCCCTTTC	C0135	67A4	CD324--E-Cadherin	BioLegend
CD325 (N-Cadherin)	CCTTCCCTTTCCTCT	C0433	8C11	CD325--N-Cadherin	BioLegend
CD326 (Ep-CAM)	TTCCGAGCAAGTATC	C0123	9C4	CD326--EpCAM	BioLegend
CD328 (Siglec-7)	CTTAGCATTTCACTG	C0902	6-434	CD328--Siglec-7	BioLegend
CD33	TAActCAGGGCCTAT	C0052	P67.6	CD33.1	BioLegend
CD335 (NKp46)	ACAATTTGAACAGCG	C0101	900	CD335--NKp46	BioLegend
CD336 (NKp44)	GGGCAATTAGCGAGT	C0802	P44-8	CD336--NKp44	BioLegend
CD337 (NKp30)	AAAGTCACTCTGCCG	C0801	P30-15	CD337--NKp30	BioLegend
CD34	GCAGAAATCTCCCTT	C0054	581	CD34.1	BioLegend
CD35	ACTTCCGTCGATCTT	C0167	E11	CD35	BioLegend
CD352 (NTB-A)	AGTTTCCACTCAGGC	C0864	NT-7	CD352--NTB-A	BioLegend
CD357 (GITR)	ACCTTTGACACTCG	C0360	108-17	CD357--GITR	BioLegend
CD36	TTCTTTGCCTTGCCA	C0407	5-271	CD36.1	BioLegend

CD360 (IL-21R)	GAGGATGATGCCATG	C0985	17A12	CD360--IL-21R	BioLegend
CD366 (Tim-3)	TGTCCTACCCAAGT	C0169	F38-2E2	CD366--Tim-3	BioLegend
CD370 (CLEC9A/DNGR1)	CTGCATTTTCAGTAAG	C0207	8F9	CD370--CLEC9A--DNGR1	BioLegend
CD38	TGTACCCGCTTGTGA	C0389	HIT2	CD38.1	BioLegend
CD39	TTACCTGGTATCCGT	C0176	A1	CD39	BioLegend
CD4	TGTTCCCGCTCAACT	C0072	RPA-T4	CD4.1	BioLegend
CD40	CTCAGATGGAGTATG	C0031	5C3	CD40.1	BioLegend
CD41	ACGTTGTGGCCTTGT	C0353	HIP8	CD41	BioLegend
CD42b	TCCTAGTACCGAAGT	C0216	HIP1	CD42b--GP1BB	BioLegend
anti-mouse/human CD44	TGGCTTCAGGTCCTA	C0073	IM7	CD44.1	BioLegend
CD45	TGCAATTACCCGGAT	C0391	HI30	CD45	BioLegend
anti-mouse/human CD45R/B220	CCTACACCTCATAAT	C0103	RA3-6B2	CD45RA	BioLegend
CD45RA	TCAATCCTTCCGCTT	C0063	HI100	CD45R--B220	BioLegend
CD45RO	CTCCGAATCATGTTG	C0087	UCHL1	CD45RO	BioLegend
CD47	GCATTCTGTACCTA	C0026	CC2C6	CD47.1	BioLegend
CD48	CTACGACGTAGAAGA	C0029	BJ40	CD48.1	BioLegend
CD49a	ACTGATGGACTCAGA	C0575	TS2/7	CD49a	BioLegend
CD49b	GCTTTCTTCAGTATG	C0371	P1E6-C5	CD49b	BioLegend
CD49d	CCATTCAACTTCCGG	C0576	9F10	CD49d	BioLegend
anti-human/mouse CD49f	TTCCGAGGATGATCT	C0070	GoH3	CD49f	BioLegend
CD5	CATTAACGGGATGCC	C0138	UCHT2	CD5.1	BioLegend
CD52	CTTTGTACGAGCAAA	C0033	HI186	CD52.1	BioLegend
CD54	CTGATAGACTTGAGT	C0217	HA58	CD54	BioLegend
CD56	TCCTTTCCTGATAGG	C0047	5.1H11	CD56	BioLegend
CD57 Recombinant	AACTCCCTATGGAGG	C0168	QA17A04	CD57-Recombinant	BioLegend
CD58 (LFA-3)	GTTCCCTATGGACGAC	C0174	TS2/9	CD58--LFA-3	BioLegend
CD62E	CTCCCTGTGGCTTAA	C0248	HAE-1f	CD62E	BioLegend
CD62L	GTCCCTGCAACTTGA	C0147	DREG-56	CD62L	BioLegend
CD62P (P-Selectin)	CCTTCCGTATCCCTT	C0218	AK4	CD62P--P-Selectin	BioLegend

CD64	AAGTATGCCCTACGA	C0162	10.1	CD64	BioLegend
CD66a/c/e	GGGACAGTTCGTTTC	C0188	ASL-32	CD66a--CD66c--CD66e	BioLegend
CD66b	AGCTGTAAGTTTCGG	C0166	6/40c	CD66b	BioLegend
CD69	GTCTCTTGCTTAAA	C0146	FN50	CD69.1	BioLegend
CD7	TGGATTCCCGGACTT	C0066	CD7-6B7	CD7.1	BioLegend
CD70	CGCGAACATAAGAAG	C0027	113-16	CD70.1	BioLegend
CD71	CCGTGTTCCCTCATTA	C0394	CY1G4	CD71	BioLegend
CD73 (Ecto-5'-nucleotidase)	CAGTTCCTCAGTTCCG	C0577	AD2	CD73--Ecto-5-nucleotidase	BioLegend
CD79b (Ig beta)	ATTCTTCAACCGAAG	C0187	CB3-1	CD79b--Ig-B	BioLegend
CD8	GCGCAACTTGATGAT	C0046	SK1	CD8	BioLegend
CD80	ACGAATCAATCTGTG	C0005	2D10	CD80.1	BioLegend
CD81 (TAPA-1)	GTATCCTTCCTTGCC	C0373	5A6	CD81--TAPA-1	BioLegend
CD82	TCCCACTTCCGCTTT	C0920	ASL-24	CD82.1	BioLegend
CD83	CCACTCATTTCCGGT	C0359	HB15e	CD83.1	BioLegend
CD85j (ILT2)	CCTTGTGAGGCTATG	C0896	GHI/75	CD85j--ILT2	BioLegend
CD86	GTCTTTGTCAGTGCA	C0006	IT2.2	CD86.1	BioLegend
CD88 (C5aR)	GCCGCATGAGAAACA	C1046	S5/1	CD88--C5aR	BioLegend
CD94	CTTCCGGTCCTACA	C0867	DX22	CD94	BioLegend
CD95 (Fas)	CCAGCTCATTAGAGC	C0156	DX2	CD95--Fas	BioLegend
CD96 (TACTILE)	TGGCCTATAAATGGT	C0175	NK92.39	CD96--TACTILE	BioLegend
CD98	GCACCAACAGCCATT	C0374	MEM-108	CD98	BioLegend
CD99	ACCCGTCCCTAAGAA	C0845	3B2/TA8	CD99.1	BioLegend
CLEC12A	CATTAGAGTCTGCCA	C0853	50C1	CLEC12A.1	BioLegend
CX3CR1	AGTATCGTCTCTGGG	C0179	K0124E1	CX3CR1.1	BioLegend
DR3 (TRAMP)	GAGTTCCTCAGTTC	C1057	JD3	DR3--TRAMP	BioLegend
EGFR	GCTTAACATTGGCAC	C0132	AY13	EGFR.1	BioLegend
Fc epsilon RI alpha	CTCGTTTCCGATCG	C0352	AER-37 (CRA-1)	FceRIa	BioLegend
GARP (LRRC32)	AGGTATGGTAGAGTA	C0901	7B11	GARP--LRRC32	BioLegend
GPR56	GCCTAGTTCCGTTT	C0912	CG4	GPR56	BioLegend



HLA-A,B,C	TATGCGAGGCTTATC	C0058	W6/32	HLA-A2	BioLegend
HLA-A2	GAACATTTCCGACAA	C0899	BB7.2	HLA-A-B-C	BioLegend
HLA-DR	AATAGCGAGCAAGTA	C0159	L243	HLA-DR	BioLegend
HLA-E	GAGTCGAGAAATCAT	C0918	3D12	HLA-E.1	BioLegend
Ig light chain kappa	AGCTCAGCCAGTATG	C0894	MHK-49	Ig-light-chain-K	BioLegend
Ig light chain lambda	CAGCCAGTAAGTCAC	C0898	MHL-38	Ig-light-chain-L	BioLegend
IgD	CAGTCTCCGTAGAGT	C0384	IA6-2	IgD	BioLegend
IgG Fc	CTGGAGCGATTAGAA	C0375	M1310G05	IgG-Fc	BioLegend
IgM	TAGCGAGCCCCGTATA	C0136	MHM-88	IgM	BioLegend
anti-human/mouse integrin $\beta$ 7	TCCTTGGATGTACCG	C0214	FIB504	integrin-B-7	BioLegend
KLRG1 (MAFA)	CTTATTTCTGCCCT	C0153	SA231A2	KLRG1--MAFA	BioLegend
LOX-1	ACCCTTTACCGAATA	C0591	15C4	LOX-1	BioLegend
anti-mouse/human Mac-2 (Galectin-3)	GATGCAATTAGCCGG	C0895	M3/38	Mac-2--Galectin-3	BioLegend
Notch 1	AATCTGTAGTGCGTT	C0213	MHN1-519	Notch-1	BioLegend
Notch 3	CTATTGGACGTATCT	C0233	MHN3-21	Notch-3	BioLegend
Podocalyxin	GAGCCGGTATAATGC	C1051	mAb 84	Podocalyxin	BioLegend
Podoplanin	GGTTACTCGTTGTGT	C0127	NC-08	Podoplanin	BioLegend
TCR alpha/beta	CGTAACGTAGAGCGA	C0224	IP26	TCR-A--TCR-B	BioLegend
TCR gamma/delta	CTTCCGATTCATTCA	C0139	B1	TCR-G--TCR-D	BioLegend
TCR V alpha 24-J alpha 18 (iNKT cell)	AACTTCTGTGGTAGC	C0584	6B11	TCR-V-A-24-J-A-18--iNKT-cell	BioLegend
TCR V alpha 7.2	TACGAGCAGTATTCA	C0581	3C10	TCR-V-A-7.2	BioLegend
TCR V beta 13.1	TTATGGACGTATGGT	C0908	H131	TCR-V-B-13.1	BioLegend
TCR V delta 2	TCAGTCAGATGGTAT	C0582	B6	TCR-V-D-2	BioLegend
TCR V gamma 9	AAGTGATGGTATCTG	C0583	B3	TCR-V-G-9	BioLegend
TIGIT (VSTM3)	TTGCTTACCGCCAGA	C0089	A15153G	TIGIT--VSTM3	BioLegend
TSLPR (TSLP-R)	CAGTCCTCTCTGTCA	C0387	1D3	TSLPR--TSLP-R	BioLegend
XCR1	AAGACGCATGTCAAC	C0208	S15046E	XCR1.1	BioLegend
Armenian Hamster IgG Isotype Ctrl	CCTGTCATTAAGACT	C0241	HTK888	armenian-hamster-IgG-isotype- ctrl	BioLegend

	Mouse IgG1, kappa isotype Ctrl	GCCGGACGACATTAA	C0090	MOPC-21	mouse-IgG1--kappa-isotype-ctrl	BioLegend
	Mouse IgG2a, kappa isotype Ctrl	CTCCTACCTAAACTG	C0091	MOPC-173	mouse-IgG2a--kappa-isotype-ctrl	BioLegend
	Rat IgG1, kappa isotype Ctrl	ATCAGATGCCCTCAT	C0236	RTK2071	rat-IgG1--kappa-isotype-ctrl	BioLegend
	Rat IgG2a, kappa Isotype Ctrl	AAGTCAGGTTCTGTTT	C0238	RTK2758	rat-IgG2a--kappa-isotype-ctrl	BioLegend
	Rat IgG2b, kappa Isotype Ctrl	GATTCTTGACGACCT	C0095	RTK4530	rat-IgG2b--kappa-isotype-ctrl	BioLegend
					mouse-IgG2b--kappa-isotype-ctrl	BioLegend
CyTOF	CD45	89	Y	HI30	-	BioLegend
	EpCAM	115	In	9C4	-	BioLegend
	CD7	139	La	M-T701	-	BD
	CD15	140	Ce	W6D3	-	Bioscience
	CD3	141	Pr	UCHT1	-	BioLegend
	CD19	142	Nd	HIB19	-	BioLegend
	CD163	144	Nd	GHI61	-	BioLegend
	CD4	145	Nd	RPA-T4	-	Thermo
	CD8a	146	Nd	RPA-T8	-	BioLegend
	CD11c	147	Sm	BU15	-	Thermo
	CD14	148	Nd	M5E2	-	BioLegend
	CD127	149	Sm	A019D5	-	BioLegend
	CD123	151	Eu	6H6	-	Thermo
	gdTCR	152	Sm	5A6.E9	-	ATCC
	CD45RA	153	Eu	HI100	-	BioLegend
	TIM3	154	Sm	F38-2E2	-	BioLegend
	TIGIT	155	Gd	A15153G	-	BioLegend
	PD-L1	156	Gd	29E.2A3	-	BioLegend
	Integrin a4	157	Gd	9F10	-	BioLegend
	CD27	158	Gd	O323	-	BioLegend
Cd137_4-1BB	159	Tb	4B4-1	-	Thermo	
Tbet	160	Gd	4B10	-	Thermo	
CTLA-4	161	Dy	14D3	-	Thermo	

FOXP3	162	Dy	PCH101	-	Thermo
CD31	163	Dy	WM59	-	BioLegend
Integrin b7	165	Ho	FIB504	-	BioLegend
CD141_BDCA3	166	Er	M80	-	BioLegend
CCR7	167	Er	GO43H7	-	BioLegend
Ki-67	168	Er	Ki-67	-	BioLegend
CD25	169	Tm	M-A251	-	BioLegend
CD1c_BDCA1	170	Er	L161	-	BioLegend
CD38	172	Yb	HIT2	-	BioLegend
ICOS	173	Yb	C398.4A	-	BioLegend
HLA-DR	174	Yb	L243	-	BioLegend
PD-1	175	Lu	EH12.2H7	-	BioLegend
CD56	176	Yb	NCAM16.2	-	BD Bioscience
CD16	209	Bi	3G8	-	BioLegend

**Table S3. Marker features used to identify coarse and fine cell annotations in blood and biopsies from CPI colitis.** Lists are provided for this predominantly steroid-experienced data set, and external steroid-naïve data set (Luoma et al. Cell 2020). Features are transcripts, with the exception of CITEseq features which are specifically noted.

**Biopsies:**

B cells	PTPRC, MS4A1, CD19, CD79A	B cycling	MIK67, ACTG1, TUBB, COTL1, STMN1, HMGB2
		B memory	CD27, IGHG1, IGHG2, IGHG3, IGHG4, IGHA1, IGHA2
		B naïve	IGHD, IGHM
CD4T	PTPRC, CD3D, CD3E, CD4, CD8A (neg), CD8B (neg), CITEseq: CD3, CD4, CD8 (neg)	CD4T fh-like	CXCR5, BCL6
		CD4T memory	PLP2, LTB, S100A11, S100A4, LGALS1, TIMP1, IL7R, VIM, AQP3
		CD4T naïve	CCR7, TCF7, SELL, KLF2, LEF1, SOX4
		CD4T reg	FOXP3, IL2RA, CTLA4, ICOS, TIGIT, RTKN2, BATF
		CD4T RM	ITGA1, CD101, CD69, ITGAE, CCR6
CD8T	PTPRC, CD3D, CD3E, CD8A, CD8B, CD4 (neg), CITEseq: CD3, CD4, CD8 (neg)	CD8T GZMB	GZMB, GNLY, GZMH, NKG7
		CD8T GZMK	GZMK, EOMES, DUSP2, CCL5
		CD8T naïve	CCR7, TCF7, SELL, KLF2, LEF1, SOX4
		CD8T RM	ITGA1, CD101, CD69, ITGAE, CCR6
Cycling	MIK67, ACTG1, TUBB, COTL1, STMN1, HMGB2	Cycling myeloid	HLA-DRA, HLA-DPA1, HLA-DRB5, HLA-DRA
		Cycling plasma	MZB1, IGKC, IGLC2, JCHAIN
		Cycling T	CD3D, CD3E, CD8A, CD4
Endothelial	PECAM1, CDH5, CLDN5	Endothelial arterial	GJA4, IGFBP3, UNC5B
		Endothelial lymphatic	LYVE1, PROX1, RELN
		Endothelial venous	MADCAM1, APLNR, PRCP
Enteric neural	CRYAB, SPARC, HAND2, ADGRB3, PLP1	-	-
Epithelial	EPCAM, FABP1, PIGR, KRT8	Epithelial absorptive colonocyte	FABP2, APOE, AQP8, SLC26A2, FABP1, CKB, AQP8, FABP6, IL32

		Epithelial BEST4_OTOP2	BEST4, OTOP2, CA7
		Epithelial EEC	CHGA, TPH1, NEUROD1, RXFP4
		Epithelial ISC	LGR5, OLFM4, ASCL2, MYC
		Epithelial secretory goblet	FOXA2, INSM1, HES6, MUC2, SPINK4, WFDC2
		Epithelial TA	MKI67, TOP2A, UBE2C
GD T cells	TRDC, TRGC1, TRGC2, TRDV1, TRDV2, TRDV3, TRGV1, TRGV2, TRGV3, TRGV4, TRGV6	-	-
ILC3	KIT, RORC, IL7R, LTB CD3D (neg)	-	-
Mast	IL18R1, KIT, CPA3, TPSB2, TPSAB1, GATA2	-	-
Mesenchymal Stromal	THY1, COL1A2, VIM, COL3A1, PDGFRA	Mesenchymal pericyte	KCNJ8, ABCC9, RGS5, CSPG4
		Mesenchymal stromal activated fibroblast	TIMP1, IL1R1, MMP1, MMP3
		Mesenchymal stromal myofibroblast	VIM, FOXF1, TAGLN, RSPO2, ACTA2, RGS5 (neg)
		Mesenchymal stromal S1	ADAMDEC1, FABP5, CTSC
		Mesenchymal stromal S2	FRZB, SOX6, F3
		Mesenchymal stromal S3	C7, ASPN, OGN
		Mesenchymal stromal S4	CCL19, C3, CD74
		Mesenchymal transitional stromal	IGFB4, DCN, ADH1, NNMT
Myeloid	PTPRC, HLA-DRA, HLA-DPA1, HLA-DRB5, HLA-DRA, C1QA, C1QB, C1QC	Myeloid activated DC	FLT3, LAMP3, CD40, CD86, CD274, CCR7, CCL17, CCL19, CCL22, EBI3
		Myeloid cDC1	FLT3, CD1C, CD1D, CLEC10A, FCER1A, FCGR2B
		Myeloid cDC2	FLT3, BATF3, CLEC9A, XCR1, CADM1, CLNK, C1orf54
		Myeloid macrophage	MERTK, CTSC, CTSD, GLUL, PLD3, CD14, CD68, FCGR3A, CSF1R, C1QA, C1QB, C1QC
		Myeloid pDC	IL3RA, SERPINF1, GZMB, CLEC4C, PTGDS, IRF7
NK	FCGR3A, NCAM1, KLRB1, KLRF1, FCER1G, CD3D (neg)	-	-
Plasma cells	MZB1, IGKC, IGLC2, JCHAIN	Plasma IgA	IGHA1, IGHA2
		Plasma IgG	IGHG1, IGHG2, IGHG3, IGHG4, IGHGP
		Plasma IgM	IGHM

**Blood:**

B cells	PTPRC, MS4A1, CD19	B memory	CD27, IGHG1, IGHG2, IGHG3, IGHG4, IGHA1, IGHA2
		B naïve	IGHD, IGHM
CD4T	PTPRC, CD3D, CD3E, CD4, CD8A (neg), CD8B (neg), CITEseq: CD4, CD8 (neg)	CD4T central memory	PLP2, LTB, S100A11, S100A4, LGALS1, TIMP1, IL7R, VIM, AQP3; CITEseq: CD62L , CD45RA (neg)
		CD4T effector	CITEseq: CD62L (neg) , CD45RA
		CD4T naïve	CCR7, TCF7, SELL, KLF2, LEF1, SOX4; CITEseq: CD62L, CD45RA
CD8T	PTPRC, CD3D, CD3E, CD8A, CD8B, CD4 (neg), CITEseq: CD4 (neg), CD8	CD8T GZMB	GZMB, GNLY, GZMH, NKG7
		CD8T GZMK	GZMK, EOMES, DUSP2, CCL5
		CD8T naïve	CCR7, TCF7, SELL, KLF2, LEF1, SOX4
Myeloid	ACTG1, TUBB, COTL1, STMN1, HMGB2, MKI67	-	-
GD T cells	TRDC, TRGC1, TRGC2, TRDV1, TRDV2, TRDV3, TRGV1, TRGV2, TRGV3, TRGV4, TRGV6	-	-
MAIT	TRAV1-2, KLRB1, DUSP1, ZBTB16, IL7R	-	-
Myeloid	PTPRC, IL1B, HLA-DRA, FCGR3A, S100A8, LST1	Myeloid classical	CD14, VCAN, S100A8, S100A9, LYZ, IL1B
		Myeloid DC	HLA-DPA1, HLA-DRB5, HLA-DRA, CLEC10A, CD1C
		Myeloid nonclassical	LST1, CSF1R, LILRB2, TNFRSF1B, FCGR3A, MS4A7
NK	FCGR3A, NCAM1, KLRB1, KLRF1, FCER1G, CD3D (neg)	-	-
pDCs	IL3RA, SERPINF1, GZMB, CLEC4C, PTGDS, IRF7	-	-
Plasma cells	MZB1, IGKC, IGLC2, JCHAIN, IGLV3-1, IGHA1	-	-
Platelets	PPBP, PF4, GP9	-	-

**Luoma CD45 sorted:**

B cells	MS4A1, CD19, CD79A
CD4T	CD3D, CD3E, CD4, CD8A (neg), CD8B (neg)
CD8T	CD3D, CD3E, CD8A, CD8B, CD4 (neg)
cDC1	FLT3, CD1C, CD1D, CLEC10A, FCER1A, FCGR2B
cDC2	FLT3, BATF3, CLEC9A, XCR1, CADM1, CLNK, C1orf54
cycling	MIK67, ACTG1, TUBB, COTL1, STMN1, HMGB2

GD	TRGC2, all [TRDV_] and [TRGV_]
ILC3	KIT, RORC, IL7R, LTB CD3D (neg)
macrophage	MERTK, CTSC, CTSD, GLUL, PLD3, CD14, CD68, FCGR3A, CSF1R, C1QA, C1QB, C1QC
mast	IL18R1, KIT, CPA3, TPSB2, TPSAB1, GATA2
NK	FCGR3A, NCAM1, KLRB1, KLRF1, FCER1G, CD3D (neg)
pDC	IL3RA, SERPINF1, GZMB, CLEC4C, PTGDS, IRF7
plasma cells	MZB1, IGKC, IGLC2, JCHAIN

**Luoma CD3 sorted:**

CD4T	CD4, CD8A (neg), CD8B (neg)	CD4T fh	CXCR5, BCL6
		CD4T naive	CCR7, TCF7, SELL, KLF2, LEF1, SOX4
		CD4T reg	FOXP3, IL2RA, CTLA4, ICOS, TIGIT, RTKN2, BATF
		CD4T RM act	CD38, HLA-DRA, ITGA1, CD101, CD69, ITGAE
		CD4T RM-mem	CD38 (lo), HLA-DRA (lo), ITGA1, CD101, CD69, ITGAE, PLP2, S100A11, S100A4, LGALS1, TIMP1, IL7R
CD8T	CD8A, CD8B, CD4 (neg)	CD8T GZMB	GZMB, GNLY, GZMH, NKG7
		CD8T GZMK	GZMK, EOMES, DUSP2, CCL5
		CD8T naive	CCR7, TCF7, SELL, KLF2, LEF1, SOX4
		CD8T RM	ITGA1, CD101, CD69, ITGAE
T CD4-CD8	CD4, CD8A, CD8B	-	-
cycling	MIK67, ACTG1, TUBB, COTL1, STMN1, HMGB2	cycling CD4T	CD4, CD8A (neg), CD8B (neg)
		cycling CD8T	CD4, CD8A, CD8B
		cycling GD	TRGC2, all [TRDV_] and [TRGV_]
GD	TRGC2, all [TRDV_] and [TRGV_]	-	-
MAIT	TRAV1-2, KLRB1, DUSP1, ZBTB16, IL7R	-	-

nonT	MS4A1, CD19, CD79A, MZB1, JCHAIN, CD68, C1QA, C1QB, C1QC	-	-
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