

Table S2. Predicted SARS-COV-2-derived CD8⁺ T cell epitopes with predicted binding affinities for HLA-A*02:01 or HLA-B*07:02. Related to STAR Methods.

HLA restriction	Peptide sequence	Position	Protein	Score_EL	%Rank_EL	Predicted binding level
A*02:01	YLQPRTFLL*	269	Spike	0.972695	0.013	SB
A*02:01	VLNDILSRL	976	Spike	0.946683	0.026	SB
A*02:01	TLDSKTQSL*	109	Spike	0.912308	0.047	SB
A*02:01	KIADYNYKL	417	Spike	0.859823	0.074	SB
A*02:01	RLDKVEAEV	983	Spike	0.850121	0.081	SB
A*02:01	RLQSLQTYV	1000	Spike	0.849935	0.081	SB
A*02:01	LLFNKVTLA	821	Spike	0.808857	0.105	SB
A*02:01	HLMSFPQSA	1048	Spike	0.79447	0.113	SB
A*02:01	VVFLHVTYV	1060	Spike	0.755669	0.144	SB
A*02:01	FIAGLIAIV	1220	Spike	0.666712	0.227	SB
B*07:02	SPRRARVA	680	Spike	0.899954	0.065	SB
B*07:02	GPCKSTNLV	526	Spike	0.610435	0.275	SB
B*07:02	TPINLVRDL	208	Spike	0.572539	0.306	SB
B*07:02	EPVLKGVKL	1262	Spike	0.564515	0.314	SB
B*07:02	QPTESIVRF	321	Spike	0.502738	0.376	SB
B*07:02	FPQSAPHGV	1052	Spike	0.499604	0.379	SB
B*07:02	IPTNFTISV	714	Spike	0.462356	0.423	SB
B*07:02	LPPAYTNSF	24	Spike	0.438154	0.458	SB
B*07:02	KPFERDIST	462	Spike	0.353815	0.581	WB
A*02:01	SLVKPSFYV	50	Envelope	0.854221	0.078	SB
A*02:01	FLAFVVFLL	20	Envelope	0.525237	0.375	SB
A*02:01	YVYSRVKKNL	57	Envelope	0.466076	0.447	SB
A*02:01	TLIVNSVLL	11	Envelope	0.381795	0.581	WB
A*02:01	IVNSVLLFL	13	Envelope	0.309928	0.763	WB
A*02:01	FVSEETGTL	4	Envelope	0.299631	0.792	WB
A*02:01	FLLVTLAIL	26	Envelope	0.282764	0.843	WB
A*02:01	SVLLFLAFV	16	Envelope	0.219388	1.07	WB
A*02:01	VLLFLAFVV	17	Envelope	0.144104	1.489	WB
A*02:01	VTLAILTAL	29	Envelope	0.090004	2.081	NA
B*07:02	YVYSRVKKNL	57	Envelope	0.144188	1.153	WB
B*07:02	NVSLVKPSF	48	Envelope	0.051477	2.218	NA
B*07:02	FVSEETGTL	4	Envelope	0.050757	2.235	NA
B*07:02	VTLAILTAL	29	Envelope	0.015086	4.148	NA
B*07:02	KPSFYVYSR	53	Envelope	0.011733	4.704	NA
B*07:02	SSRVPDLLV	67	Envelope	0.008558	5.489	NA
B*07:02	IVNSVLLFL	13	Envelope	0.008508	5.503	NA
B*07:02	LAILTALRL	31	Envelope	0.008031	5.668	NA
B*07:02	FVVFLLVTL	23	Envelope	0.005874	6.532	NA
B*07:02	LVKPSFYVY	51	Envelope	0.005264	6.88	NA
A*02:01	KLLEQWNLV	15	Membrane	0.898887	0.053	SB
A*02:01	FVLAAYRI	65	Membrane	0.49427	0.409	SB
A*02:01	SMWSFNPET	108	Membrane	0.460519	0.454	SB
A*02:01	GLMWLSYFI	89	Membrane	0.441625	0.48	SB
A*02:01	LLWPVTLAC	56	Membrane	0.230705	1.023	WB
A*02:01	WLLWPVTLA	55	Membrane	0.213384	1.095	WB
A*02:01	RLFARTRSM	101	Membrane	0.167886	1.323	WB
A*02:01	FLFLTWICL	26	Membrane	0.142011	1.503	WB
A*02:01	FIASFRLFA	96	Membrane	0.141834	1.504	WB
A*02:01	TLACFVLAA	61	Membrane	0.128495	1.59	WB
B*07:02	LPKEITVAT	164	Membrane	0.46273	0.423	SB
B*07:02	HLRIAGHHL	148	Membrane	0.370087	0.557	WB
B*07:02	RLFARTRSM	101	Membrane	0.333256	0.615	WB
B*07:02	RPLLESELV	131	Membrane	0.136447	1.195	WB

B*07:02	NVPLHGTL	121	Membrane	0.053044	2.18	NA
B*07:02	VPLHGILT	122	Membrane	0.047466	2.314	NA
B*07:02	FAYANRNR	37	Membrane	0.039055	2.53	NA
B*07:02	ITVATSR	168	Membrane	0.028244	3.013	NA
B*07:02	GAVILRGHL	141	Membrane	0.025424	3.198	NA
B*07:02	SFNPETNIL	111	Membrane	0.022685	3.378	NA
A*02:01	LLDRLNQL*	222	Nucleocapsid	0.951445	0.024	SB
A*02:01	KLDDKDPNF	338	Nucleocapsid	0.559155	0.339	SB
A*02:01	GMSRIGMEV	316	Nucleocapsid	0.409317	0.531	WB
A*02:01	LQLPQGTTL	159	Nucleocapsid	0.219198	1.071	WB
A*02:01	DLDDFSKQL	399	Nucleocapsid	0.191364	1.197	WB
A*02:01	AQFAPSASA	305	Nucleocapsid	0.17815	1.264	WB
A*02:01	RLNQLESKM	226	Nucleocapsid	0.116993	1.704	WB
A*02:01	ILLNKHIDA	351	Nucleocapsid	0.112742	1.751	WB
A*02:01	TTLPKGFYA	165	Nucleocapsid	0.092237	2.041	NA
A*02:01	RTATKAYNV	262	Nucleocapsid	0.085053	2.169	NA
B*07:02	FPRGQGVPI	66	Nucleocapsid	0.970857	0.019	SB
B*07:02	KPRQKRTAT	257	Nucleocapsid	0.845878	0.1	SB
B*07:02	SPRWYFYFL*	105	Nucleocapsid	0.78941	0.139	SB
B*07:02	LPNNTASWF	45	Nucleocapsid	0.281028	0.716	WB
B*07:02	RIRGGDGKM	93	Nucleocapsid	0.277615	0.723	WB
B*07:02	GPEQTQGNF	278	Nucleocapsid	0.250908	0.777	WB
B*07:02	RPQGLPNNT	41	Nucleocapsid	0.236468	0.809	WB
B*07:02	TPSGTWLTY	325	Nucleocapsid	0.199278	0.917	WB
B*07:02	KAYNVTQAF	266	Nucleocapsid	0.196035	0.929	WB
B*07:02	APRITFGGP	12	Nucleocapsid	0.14837	1.13	WB
A*02:01	LLYDANYFL	139	ORF3A	0.967105	0.017	SB
A*02:01	ALSKGVHFV	72	ORF3A	0.94978	0.024	SB
A*02:01	TVYSHLLLV	89	ORF3A	0.85148	0.08	SB
A*02:01	YLYALVYFL	107	ORF3A	0.830503	0.093	SB
A*02:01	IVDEPEEHV	236	ORF3A	0.617627	0.277	SB
A*02:01	ALLAVFQSA	51	ORF3A	0.590547	0.306	SB
A*02:01	ALVYFLQSI	110	ORF3A	0.540919	0.358	SB
A*02:01	GLEAPFLYL	100	ORF3A	0.478119	0.431	SB
A*02:01	NLLLLFVTV	82	ORF3A	0.361087	0.626	WB
A*02:01	ATIPIQASL	33	ORF3A	0.315224	0.748	WB
B*07:02	IPIQASLPF	35	ORF3A	0.773507	0.149	SB
B*07:02	APFLYLYAL	103	ORF3A	0.621391	0.266	SB
B*07:02	ATIPIQASL	33	ORF3A	0.188654	0.956	WB
B*07:02	TPSDFVRAT	24	ORF3A	0.163307	1.058	WB
B*07:02	IPYNSVTSS	158	ORF3A	0.117318	1.326	WB
B*07:02	QSASKIITL	57	ORF3A	0.082125	1.67	WB
B*07:02	SINFVRIIM	117	ORF3A	0.079894	1.698	WB
B*07:02	KCRSKNPLL	132	ORF3A	0.057908	2.063	NA
B*07:02	ITLKKRWQL	63	ORF3A	0.041058	2.468	NA
B*07:02	LALSKGVHF	71	ORF3A	0.019844	3.604	NA
A*02:01	HLVDFQVTI	3	ORF6	0.925606	0.039	SB
A*02:01	NLDYIINLI	28	ORF6	0.408601	0.532	WB
A*02:01	TIAEILLI	10	ORF6	0.255021	0.933	WB
A*02:01	LIIMRTFKV	16	ORF6	0.184755	1.23	WB
A*02:01	SIWNLDYII	25	ORF6	0.11402	1.737	WB
A*02:01	VTIAEILLI	9	ORF6	0.095616	1.983	WB
A*02:01	SQLDEEQPM	50	ORF6	0.075866	2.332	NA
A*02:01	FQVTIAEIL	7	ORF6	0.067993	2.472	NA
A*02:01	IINLIKNL	32	ORF6	0.053716	2.858	NA
A*02:01	IMRTFKVSI	18	ORF6	0.026191	4.225	NA
B*07:02	IKNLSKSL	36	ORF6	0.230076	0.827	WB
B*07:02	IMRTFKVSI	18	ORF6	0.022604	3.383	NA
B*07:02	LTENKYSQL	44	ORF6	0.015514	4.085	NA

B*07:02	IINLIKLN	32	ORF6	0.006437	6.277	NA
B*07:02	SQLDEEQPM	50	ORF6	0.003644	8.176	NA
B*07:02	HLVDFQVTI	3	ORF6	0.002296	10.134	NA
B*07:02	QVTIAEILL	8	ORF6	0.001767	11.395	NA
B*07:02	TFKVSINLN	21	ORF6	0.001479	12.315	NA
B*07:02	IAEILLIIM	11	ORF6	0.00144	12.469	NA
B*07:02	LIIMRTFKV	16	ORF6	0.001225	13.379	NA
A*02:01	KLFIRQEEV	85	ORF7a	0.841044	0.087	SB
A*02:01	ELYSPIFLI	95	ORF7a	0.549733	0.349	SB
A*02:01	ILFLALITL	4	ORF7a	0.509315	0.391	SB
A*02:01	ELYHYQECV	16	ORF7a	0.229441	1.028	WB
A*02:01	FLALITLAT	6	ORF7a	0.1286	1.589	WB
A*02:01	PLADNKFAL	48	ORF7a	0.099037	1.928	WB
A*02:01	FAFACPDGV	63	ORF7a	0.092682	2.033	NA
A*02:01	KIILFLALI	2	ORF7a	0.04918	2.985	NA
A*02:01	LIVAAIVFI	102	ORF7a	0.046974	3.069	NA
A*02:01	VAAIVFITL	104	ORF7a	0.021317	4.671	NA
B*07:02	RARSVSPKL	78	ORF7a	0.809781	0.125	SB
B*07:02	SPIFLIVAA	98	ORF7a	0.261097	0.757	SB
B*07:02	CPDGVKHVY	67	ORF7a	0.147393	1.135	WB
B*07:02	CVRGTTVLL	23	ORF7a	0.122408	1.289	WB
B*07:02	EGNSPFHPL	41	ORF7a	0.072505	1.795	WB
B*07:02	SPKLFIRQE	83	ORF7a	0.044726	2.38	NA
B*07:02	VAAIVFITL	104	ORF7a	0.02756	3.058	NA
B*07:02	HPLADNKFA	47	ORF7a	0.025196	3.213	NA
B*07:02	GTYEGNSPF	38	ORF7a	0.023104	3.351	NA
A*02:01	YIDIGNYTV	73	ORF8	0.854638	0.078	SB
A*02:01	FLEYHDVRV	108	ORF8	0.673457	0.221	SB
A*02:01	KLGLSLVRC	94	ORF8	0.278824	0.855	WB
A*02:01	YVDDPCPI	31	ORF8	0.202898	1.143	WB
A*02:01	FLGIITVA	6	ORF8	0.193424	1.187	WB
A*02:01	VFLGIITV	5	ORF8	0.152288	1.434	WB
A*02:01	LVFLGIIT	4	ORF8	0.035592	3.564	NB
A*02:01	TVSCLPFTI	80	ORF8	0.029176	3.988	NB
A*02:01	TINCQEPKL	87	ORF8	0.02236	4.549	NB
A*02:01	SCTQHQPYPV	24	ORF8	0.02063	4.752	NB
B*07:02	EPKLGSLVV	92	ORF8	0.397295	0.516	WB
B*07:02	RKSAPLIEL	52	ORF8	0.029648	2.947	NB
B*07:02	VGARKSAPL	49	ORF8	0.028093	3.023	NB
B*07:02	GARKSAPLI	50	ORF8	0.02662	3.12	NB
B*07:02	AAFHQECSL	14	ORF8	0.02525	3.21	NB
B*07:02	EYHDVRVVL	110	ORF8	0.020104	3.576	NB
B*07:02	CPIHFYSKW	37	ORF8	0.01498	4.164	NB
B*07:02	YIDIGNYTV	73	ORF8	0.011096	4.836	NB
B*07:02	GIITTVAAF	8	ORF8	0.007836	5.735	NB
B*07:02	CQEPKLGSL	90	ORF8	0.007647	5.8	NB

SARS-COV-2-derived CD8⁺ T cell epitopes were predicted using NetMHCpan version 4.1. SB: strong binder (% Rank < 0.5). WB: weak binder (% Rank < 2.00). Peptides selected for tetramer-based analyses are highlighted in bold font. Peptides that elicited positive responses are denoted with asterisks.

Table S3. Donor characteristics. Related to STAR Methods.

	Severe Acute (n = 17)	Mild Acute (n = 10)	Severe convalescent (n = 26)	Mild convalescent (n = 40)	Exposed relatives (n = 30)	2020 blood donors (n = 55)	2019 blood donors (n = 28)
Age (median, years)	58	52	51	51	42	n/d	n/d
Gender (% male/female)	82/18	70/30	88/12	45/55	33/67	n/d	n/d
History of travel	n/d	n/d	33%	85% (79% Italy)	33% (100% Italy)	n/d	n/d
BMI (median)	32	28	28	24	n/d	n/d	n/d
Smoker	44% (7/16)	40% (2/5)	38% (past/now)	23% (past/now)	n/d	n/d	n/d
Diabetes	29%	30%	35%	10%	0%	n/d	n/d
Hypertension	35%	20%	42%	15%	0.7%	n/d	n/d
Other chronic diseases	71%	50%	19%	15%	17%	n/d	n/d
PCR positivity	100%	100%	100%	100%	n/d	n/d	n/d
Viremia at time of sampling	47%	40%	n/d	n/d	n/d	n/d	n/d
Time from debut of symptom to sampling (median +-IQR, days)	14 (12-17)	14 (11-14)	52 (42-58)	55 (49-64)	n/d	n/d	n/d
Time from symptom free to sampling (median +-IQR, days)	n/d	n/d	13 (3-21)	39 (25-53)	n/d	n/d	n/d
Asymptomatic	0%	0%	0%	0%	21%	n/d	n/d
Outcome	76% alive	100% alive	100% alive	100% alive	100% alive	n/d	n/d
Antibody positivity	82%	50%	100%	85%	64%	n/d	n/d

BMI: body mass index (18.5-24.5 normal; 25-29.9 overweight; >30 obesity); n/d: not determined.

Table S4. Breakdown of samples used in each assay by group. Related to STAR Methods.

	Phenotype	Tetramer	Function	Proliferation	Activation	ELISpot	Serology	Inflammation
Acute severe	17/17	17/17	3/17		3/17		17/17	17/17
Severe convalescent	26/26	26/26	26/26	26/26	4/26	22/26	23/26	
Acute moderate	10/10	10/10	3/10		3/10		10/10	10/10
Mild convalescent	40/40	40/40	40/40	40/40	2/40	30/40	31/40	
Exposed relatives	30/30	30/30	30/30	30/30	8/30	29/30	28/30	
2020 blood donors	24/55	24/55	31/55	31/55	6/55	25/55	25/55	24/55
2019 blood donors			28/28	28/28		24/28		