T cells Take the Lead in COVID-19

T CELLS ARE IMPORTANT FOR THE RECOVERY OF COVID-19 DISEASE

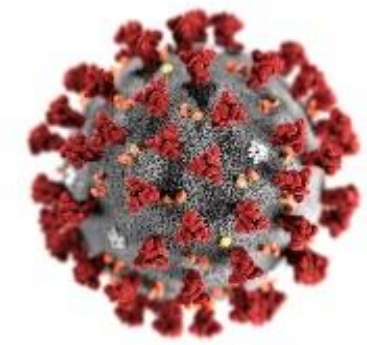
CD4+ and CD8+ T-cell responses to SARS-CoV-2 are crucial for initially resolving acute viral infection and later to assist protection against reinfection through immunological memory (long-lasting immunity) [13,15].

Understanding the specificity, frequency, and durability of the T-cell response is important for defining correlates of protective immunity and helping researchers identify effective vaccine antigens.

SARS-CoV-2-specific memory CD4+ and CD8+ T cells are found in convalescent individuals, including asymptomatic cases [7].

Comprehensive epitope mapping has revealed that functional CD4+ and CD8+ T cells targeting multiple antigens of SARS-CoV-2 are maintained in the resolution phase of both mild and severe COVID-19 [1-12, 14]. Such multi-specific T-cell responses are well suited to provide broad protection, counteracting viral escape mechanisms such as mutation or variable antigen presentation.

Monitoring T-cell responses to numerous epitopes provide a clear picture of the immunity in recovering patients and highlight the potential to pursuit epitopes from multiple antigens as targets for immunotherapies and vaccines.



WHAT REMAINS TO BE LEARNED?

Much has been learned about COVID-19 immunity in 2020. However, many open questions crucial for fighting the disease still exist:

- Will the first vaccines provide long-lasting immunity?
- What is the efficacy of a vaccine?
- Do some people have pre-existing immunity to SARS-CoV-2?
- Are some T-cell epitopes immunodominant?
- Are disease severeness reflected in the immunological response?

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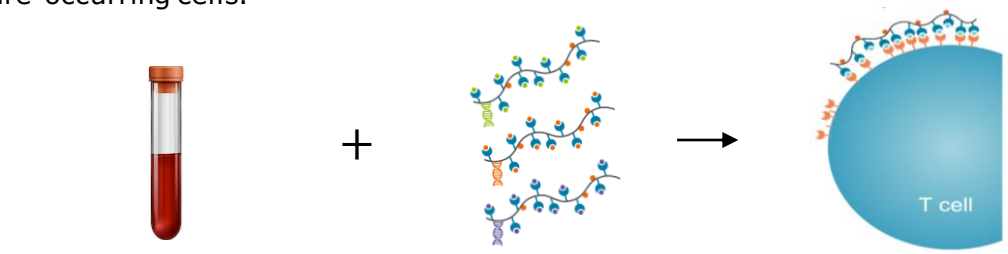
Published COVID-19 T-cell Epitopes

We want to share with you a curated list of the published epitopes shown to be recognized by T cells in COVID-19 patients. This list of SARS-CoV-2 specific T-cell epitopes reflects research presented by dedicated scientists around the world in many recent peer reviewed and non-peer reviewed papers.

Thanks to it, you can now choose the most suitable epitopes for your SARS-CoV-2 specific T-cells research and answer some of the questions that remain unanswered about the COVID-19 immunity.

We can help you study COVID-19 immunity

Immudex Dextramer® Technology can help you characterize circulating SARS-CoV-2-specific CD4+ and CD8+ T cells in blood from infected individuals without missing rare-occurring cells.



Blood samples from COVID-19 infected patients or vaccinated people

dCODE Dextramer® Panel

Dextramer® binds to TCR on virus -specific T cells

- MHC I and II Dextramer® reagents comprising SARS-CoV-2-epitopes from the list of proven epitopes. Stain blood samples and visualize virus-specific T cells by flow cytometry.
- dCODE Dextramer® (HiT) Technology for epitope discovery or T-cell profiling in bulk solution. The unique DNA barcode enables the detection of antigen-specific T cells by PCR followed by Next Generation Sequencing.
- COVID-19 dCODE Dextramer® Panels allow you to make a full multi-omic profile of the virus-specific immune response by detecting antigen-specific T cells and their T-cell receptor sequencing at the single-cell level. Use a predefined panel or make your own selection from the list of proven T-cell epitopes.

Immudex is your preferred partner in immune monitoring. Our Dextramer® and dCODE® Technologies can help you unravel the specificity of T-cell immunity with high specificity and sensitivity. Learn more or contact us to discuss your research need at customer@immudex.com

Published COVID-19 T-cell Epitopes

Version 2. November 19, 2020

HLA Allele	Peptide	Antigen	Reference	T-cell immune monitoring assays	
				MHC Multimer	Other assay
A*0101	ATSRTLSYY	Membrane	6		X
A*0101	CTDDNALAY	ORF1ab	8	X	
A*0101	CTDDNALAYY	ORF1ab	6, 8, 11	X	X
A*0101	DTDFVNEFY	ORF1ab	6, 8, 11, 14	X	X
A*0101	FTSDYYQLY	ORF3a	2, 6, 8, 10, 14	X	X
A*0101	GTDLEGNFY	ORF1ab	6, 14	X	X
A*0101	LTDEMIAQY	Spike	5, 8, 14	X	X
A*0101	NTCDGTTFTY	ORF1ab	6		X
A*0101	PTDNYITTY	ORF1ab	6, 11, 14	X	X
A*0101	RTFKVSIWNLDY	ORF6	5		X
A*0101	TTDPSFLGRY	ORF1ab	5, 6, 10, 11	X	X
A*0101	TVATSRTLSY	Membrane	11	X	
A*0101	TTDPSFLGRYM	ORF1ab	10	X	
A*0101	CTEIDPKLDNY	ORF1ab	10	X	
A*0101	HTTDPSFLGRY	ORF1ab	14	X	
A*0201	ALSKGVHFV	ORF3	5, 7, 14	X	X
A*0201	ALWEIQQVV	ORF1ab	6, 14	X	X
A*0201	FLHVTYVPA	Spike	4		X
A*0201	FLLPSLATV	ORF1ab	8	X	
A*0201	GMSRIGMEV	Nucleocapsid	8, 16	X	
A*0201	HLVDFQVTI	ORF6	7	X	
A*0201	ILFTRFFYV	ORF1ab	8	X	
A*0201	KIYSKHTPI	Spike	4		X
A*0201	KLLEQWNLV	Membrane	7	X	
A*0201	KLPDDFTGCV	Spike	4		X
A*0201	KLWAQCVQL	ORF1ab	6		X
A*0201	LALLLLDRL	Nucleocapsid	8	X	
A*0201	LLFNKVTLA	Spike	4		X
A*0201	LLLDRLNQL	Nucleocapsid	6, 7, 8, 14, 16	X	X
A*0201	LLLLDRLNQL	Nucleocapsid	5		X
A*0201	LLYDANYFL	ORF3a	6, 7, 8, 14	X	X
A*0201	RLDKVEAEV	Spike	4		X
A*0201	RLITGRLQSL	Spike	4		X
A*0201	RLQSLQTYV	Spike	1	X	X
A*0201	SLVKPSFYV	Envelope	7	X	

Published COVID-19 T-cell Epitopes

Version 2. November 19, 2020

HLA Allele	Peptide	Antigen	Reference	T-cell immune monitoring assays	
				MHC Multimer	Other assay
A*0201	TLDSKTQSL	Spike	7	X	
A*0201	VLNDILSRL	Spike	7, 16	X	
A*0201	YLFDESGEFKL	ORF1ab	6	X	X
A*0201	YLQPRTFLL	Spike	1, 6, 7, 9, 11, 14, 16	X	X
A*0201	YLYALVYFL	ORF3a	8, 14	X	
A*0201	RLNEVAKNL	Spike	11, 16	X	
A*0201	FLLNKEMYL	ORF1ab	9	X	
A*0201	NLLLLFVTV	ORF3	10	X	
A*0201	RTIKVFTTV	ORF1ab	10	X	
A*0201	SLDTYPSLETI	ORF1ab	10	X	
A*0201	YLATALLTL	ORF1ab	14	X	
A*0201	YLDAYNMMI	ORF1ab	14	X	
A*0201	NLIDSYFVV	ORF1ab	14	X	
A*0201	VVFLHVTYV	Spike	14	X	
A*0201	TLACFVLAAV	Membrane	16	X	
A*0201	ILLNKHIDA	Nucleocapsid	16	X	
A*0201	NLNESLIDL	Spike	16	X	
A*0201	FIAGLIAIV	Spike	16	X	
A*0301	KCYGVSPTK	Spike	6		X
A*0301	KLFAAETLK	ORF1ab	5		X
A*0301	KTFPPTEPK	Nucleocapsid	2, 6, 11, 14	X	X
A*0301	KTFPPTEPKK	Nucleocapsid	5		X
A*0301	KTIQPRVEK	ORF1ab	6, 14	X	X
A*0301	MVTNNTFTLK	ORF1ab	6		X
A*0301	QLRARSVSPK	ORF7	5		X
A*0301	RMYIFFASFY	ORF1ab	8	X	
A*0301	VVYRGTTTYK	ORF1ab	8, 14	X	
A*0301	VTNNTFTLK	ORF1ab	14	X	
A*0301	GVYFASTEK	Spike	14	X	
A*0301	KLFDRYFKY	ORF1ab	14	X	
A*0301	TSFGPLVRK	ORF1ab	14	X	
A*0301	SASKIITLK	ORF3a	14	X	
A*0301	TISLAGSYK	ORF1ab	14	X	
A*1101	ASAFFGMSR	Nucleocapsid	6		X

Published COVID-19 T-cell Epitopes

Version 2. November 19, 2020

HLA Allele	Peptide	Antigen	Reference	T-cell immune monitoring assays	
				MHC Multimer	Other assay
A*1101	ASMPTTIAK	ORF1ab	5, 8	X	X
A*1101	ATEGALNTPK	Nucleocapsid	5, 6		X
A*1101	ATSRTLSYYK	Membrane	6		X
A*1101	KTFPPTEPK	Nucleocapsid	2, 6, 14	X	X
A*1101	SAFAMMFVK	ORF1ab	8, 14	X	
A*1101	STFNVPMEK	ORF1ab	8, 14	X	
A*1101	VTDTPKGPK	ORF1ab	6		X
A*1101	VVNARLRAK	ORF1ab	14	X	
A*1101	RLFRKSNLK	Spike	14	X	
A*1101	VTNNTFTLK	ORF1ab	14	X	
A*1101	GTHWFVTQR	Spike	14	X	
A*1101	AGFSLWVYK	ORF1ab	14	X	
A*1101	AVFDKNLYDK	ORF1ab	14	X	
A*1101	TISLAGSYK	ORF1ab	14	X	
A*1101	GVYFASTEK	Spike	14	X	
A*1101	SASKIITLK	ORF3a	14	X	
A*1101	KTIQPRVEK	ORF1ab	14	X	
A*2402	DYKHWPQIAQF	Nucleocapsid	5		X
A*2402	FYVYSRVKNL	Envelope	5		X
A*2402	QYIKWPWYI	Spike	5, 6, 11, 14	X	X
A*2402	VYFLQSINF	ORF3a	5, 6, 14	X	X
A*2402	VYIGDPAQL	ORF1ab	5, 6, 14	X	X
A*2402	FYAYLRKHF	ORF1ab	10	X	
A*2402	NYNYLYRLF	Spike	14	X	
A*2402	NYMPYFFTL	ORF1ab	14	X	
A*2402	YYTSNPTTF	ORF1ab	14	X	
A*2402	RFDNPVLPF	Spike	14	X	
A*2402	TYACWHHSI	ORF1ab	14	X	
B*0702	FPRGQGVPI	Nucleocapsid	5, 7, 8	X	X
B*0702	IPRRNVATL	ORF1ab	6, 8, 14	X	X
B*0702	KPRQKRTAT	Nucleocapsid	7, 8	X	
B*0702	NPANNAAIVL	Nucleocapsid	5		X
B*0702	RPDTRYVL	ORF1ab	6		X
B*0702	SPRRARSVA	Spike	7, 8	X	
B*0702	SPRWYFYYL	Nucleocapsid	2, 6, 7, 8, 10, 14	X	X

Published COVID-19 T-cell Epitopes

Version 2. November 19, 2020

HLA Allele	Peptide	Antigen	Reference	T-cell immune monitoring assays	
				MHC Multimer	Other assay
B*0702	QPGQTFSVL	ORF1ab	14	X	
B*0702	RARSVSPKL	ORF7a	14	X	
B*0702	APHGVVFL	Spike	14	X	
B*0702	RPDTRYVLM	ORF1ab	14	X	
B*0801	DLKGKYVQI	ORF1ab	5		X
B*0801	EAFEKMVSL	ORF1ab	5		X
B*0801	FVKHKHAFL	ORF1ab	5		X
B*0801	TPKYKFVRI	ORF1ab	5		X
B*1501	AQFAPSASAF	Nucleocapsid	8	X	
B*1501	KQLIKVTLVF	ORF1ab	8	X	
B*1501	LVQMAPISAM	ORF1ab	8	X	
B*1501	YLITPVHVM	ORF1ab	10	X	
B*2705	QRNAPRITF	Nucleocapsid	2	X	
B*4001	AEWFLAYIL	ORF1ab	8	X	
B*4001	GETLPTEVL	ORF1ab	8	X	
B*4001	GEVITFDNL	ORF1ab	8	X	
B*4001	GEAANFCAL	ORF1ab	8	X	
B*4001	TEVVGDIIL	ORF1ab	8	X	
B*4001	IEYPIIGDEL	ORF1ab	5		X
B*4001	LEYHDVRVVL	ORF8	5		X
B*4001	MEVTPSGTWL	Nucleocapsid	2, 5, 8	X	X
B*4001	SELVIGAVIL	Membrane	5		X
B*4001	YEGNSPFHPL	ORF7	5		X
B*4403	AEWFLAYILF	ORF1ab	8	X	
B*4403	EEAIRHVRAW	ORF1ab	8	X	
B*4403	EEIAIILASF	ORF1ab	8	X	
B*4403	MEVTPSGTW	Nucleocapsid	8	X	
B*4403	QEILGTVSW	ORF1ab	8	X	
B*4403	QEYADVFHLY	ORF1ab	8	X	
B*4403	SEFSSLPSY	ORF1ab	8	X	
B*4403	YEQYIKWPW	Spike	8	X	
C*0602	FYYVWKSYV	ORF1ab	10	X	
C*0702	NRFLYIIKL	Membrane	5		X
C*0702	QRNAPRITF	Nucleocapsid	5		X

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Version 2. November 19, 2020

HLA Allele	Peptide	Antigen	Reference	T-cell immune monitoring assays	
				MHC Multimer	Other assay
C*0702	YYQLYSTQL	ORF3a	5		X
C*0702	FYYVWKSYV	ORF1ab	10	X	
C*0702	SLRPDTRYVL	ORF1ab	10	X	
DRB1*0101 DRB1*0401 DRB1*0701 DRB1*1501	QLIRAAEIRASANLAATK	Spike	2	X	
DR	KDGIIWVATEGALNT	Nucleocapsid	5		X
DR	GTWLTYTGAIKLDDK	Nucleocapsid	5		X
DR	RWYFYYLGTGPEAGL	Nucleocapsid	5		X
DR	ASWFTALTQHGKEDL	Nucleocapsid	5		X
DR	ASAFFGMSRIGMEVT	Nucleocapsid	5		X
DR	IGYYRRATRRIRGGD	Nucleocapsid	5		X
DRB1*0101	LLLLDRLNQLESKMS	Nucleocapsid	5		X
DR	AADLDDFSKQLQQSM	Nucleocapsid	5		X
DR	AIVLQLPQGTTLPKG	Nucleocapsid	5		X
DR	YKHWPQIAQFAPSAS	Nucleocapsid	5		X
DR	LDDFVEIIKSQDLSV	ORF1ab	5		X
DR	ITRFQTLLALHRSYL	Spike	5		X
DR	FNGLTVLPPLLTDEM	Spike	5		X
DR	FMRIFTIGTVTLKQG	ORF3a	5		X
DRB1*0101 DRB1*0401 DRB1*0701	FYVYSRVKNLNSSRV	Envelope	5		X
DR	LSYYKLGASQRVAGD	Membrane	5		X
DR	IWNLDYIINLIIKNL	ORF6	5		X
DR	QEEVQELYSPIFLIV	ORF7	5		X
DR	SKWYIRVGARKSAPL	ORF8	5		X
DR	INVFAFPFTIYSLLL	ORF10	5		X

Published COVID-19 T-cell Epitopes

Version 2. November 19, 2020

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