Accelerate Your Immuno-Oncology Research from Early Discovery to Clinical Trials

Version 1. October 2021

Recent advances in revealing how the immune system can recognize and target cancer cells have led to novel immunotherapeutic strategies within the immune-oncology field. Although immunotherapy has brought new and improved treatments to patients resistant to the classical ones, scientists worldwide continue their research to develop more potent personalized cancer vaccines with minimal toxicity effect.

IMPORTANCE OF DEFINING SUITABLE TUMOR ANTIGENS

When tumor cells are formed, they express antigens on the cell surface as part of the major histocompatibility complex (MHC) or release them into the bloodstream. The immune system can recognize these tumor antigens, and that triggers an immune response against cancer. Thus, specific tumor antigens can be valuable markers in cancer diagnostics and used as tumor antigen vaccines in personalized cancer immunotherapy.

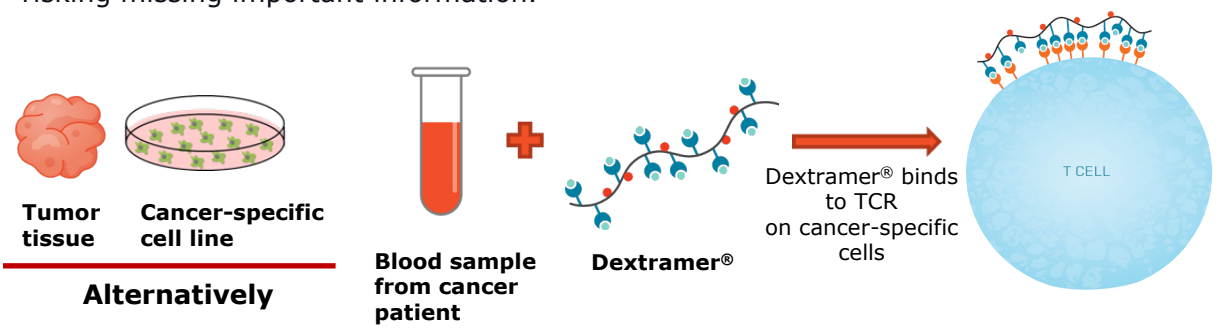
Tumor antigens are generally classified into two categories based on their expression pattern:

- **tumor-specific antigens (TSA)** primarily found in cancer cells. TSA are mutation-derived neoantigens and can cause the tumor due to mutation in the conserved gene (p53 genes).
- **tumor-associated antigens (TAA)** highly expressed on tumor cells but can also be found at lower levels on healthy cells. TAA are produced due to the mutation in genes unrelated to tumor formation.

Other tumor antigens include tissue differentiation antigens, cancer-germline antigens, oncofetal antigens, etc. Thus, defining suitable tumor antigens is essential for triggering efficient and durable host immune responses against cancer.

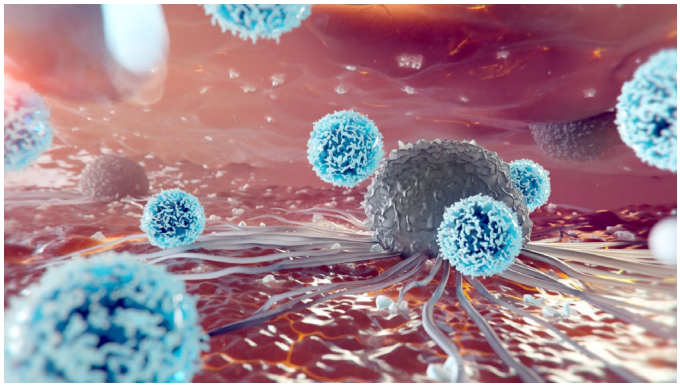
MOVE FORWARD WITH YOUR CANCER RESEARCH STRATEGY

Immudex Dextramer® technology can help you detect, quantify or isolate cancer-specific CD8+ and CD4+ T cells in peripheral blood, tumor biopsies, or tissue without risking missing important information.



SOLUTIONS THAT ADAPT TO YOUR RESEARCH NEEDS

Immudex is an established expert in cancer-specific immune monitoring from early discovery to clinical trials. Our Dextramer® and dCODE Dextramer® technologies can help you characterize cancer immunity across different platforms, allowing you to continue directly from in-situ, to flow cytometry, and move onto NGS or single-cell multi-omics.



- **MHC I** and **MHC II Dextramer®** reagents comprise a broad selection of T-cell epitopes to monitor the whole spectrum of cancer-specific T-cell responses by flow cytometry, including T cells with rare and low-affinity receptors. Hand-picked and **ready-to-use melanoma** and **cancer-testis panels** are also available for your research.
- **MHC I Dextramer® In-Situ Staining** reagents can help detect distinct localization, distribution, and abundance of cancer-specific CD8+ T cells within diverse tissue niches in health and disease.
- **dCODE Dextramer®** 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 (NGS) and single-cell multi-omics.
- **U-Load Dextramer®** reagents to easily make your choice of customized multimers directly in the lab from a broad range of peptide-receptive MHC I and MHC II alleles and your own peptide, via flow cytometry or single-cell multi-omics.
- **Klickmer®** reagents can be customized to help you to explore immunity beyond T cells by looking into other immune cells like B cells or study TCR-ligand interactions in cancer cells by flow cytometry or single-cell multi-omics.

Learn more or contact us to discuss your research need at **customer@immudex.com**

SELECT THE MOST SUITABLE TUMOR-SPECIFIC ANTIGEN FOR YOUR RESEARCH

To support clinicians and scientists worldwide in their cancer research, we want to share a comprehensive list of human cancer antigens recognized by T cells. This list of cancer-specific T-cell epitopes reflects the research of many dedicated scientists published in peer-reviewed papers.
You can now select the epitopes from the list that best fit your cancer research.

Published Human Cancer T-Cell Epitopes

Version 1. October 2021

HLA Allele	Peptide	Antigen	Disease	Reference
A*0101	TLDTLTAFY	MSLN	Cancer	3
A*0101	FTELTLGEF	Survivin	Cancer	4
A*0101	TSEKRPFMCAY	WT1	Cancer	7, 8
A*0101	EADPTGHSY	MAGE-1	Melanoma	2
A*0101	EVDPIGHLY	MAGE-3	Melanoma	1, 2, 10
A*0101	KSDICTDEY	Tyrosinase	Melanoma	9
A*0101	SSDYVIPIGTY	Tyrosinase	Melanoma	11
A*0201	QQAHCLWCV	ABL1	Cancer	13
A*0201	ALDVYNGLL	ACPP	Cancer	12
A*0201	GLQHWVPEL	BA46	Cancer	17
A*0201	NLFETPVEA	BA46	Cancer	17
A*0201	KLDVGNAEV	BAP31	Cancer	14
A*0201	ALSPVPPVV	BCL-2	Cancer	15
A*0201	WLSLKTLLSL	BCL-2	Cancer	16, 24
A*0201	YLNRHLHTWI	BCL-2	Cancer	18
A*0201	YLNDHLEPWI	BCL-X	Cancer	16, 19
A*0201	GVRGRVEEI	BCR-ABL	Cancer	20
A*0201	CLPSPSTPV	BMI1	Cancer	21, 22
A*0201	TLQDIVYKL	BMI1	Cancer	21, 22
A*0201	MLMAQEALAFL	CAMEL	Cancer	23
A*0201	ALYLMELTM	CB9L2	Cancer	24, 25
A*0201	YLISGDSPV	CD33	Cancer	26
A*0201	YLSGANLNL	CEACAM	Cancer	27, 28
A*0201	ILGVLTSLV	DLK1	Cancer	29
A*0201	TLADFDPRV	EphA2	Cancer	30, 31
A*0201	SQADALKYV	EZH2	Cancer	32, 33

Published human cancer T-cell epitopes

Version 1. October 2021

HLA Allele	Peptide	Antigen	Disease	Reference
A*0201	YMCSFLFNL	EZH2	Cancer	32
A*0201	TLFWLLLTL	VEGFR1	Cancer	149, 152
A*0201	EIWTHSYKV	FOLR1	Cancer	34
A*0201	FVGEFFTDV	Glypican 3	Cancer	35, 36, 145, 146
A*0201	YLEPGPVTV	gp100	Cancer	37, 38
A*0201	QLFEELQEL	HO-1	Cancer	39
A*0201	LLLGPLGPL	Heparanase	Cancer	40, 41
A*0201	ILHDGAYSL	HER2	Cancer	42
A*0201	KIFGSLAFL	HER2	Cancer	43, 44
A*0201	LIAHNQVRQV	HER2	Cancer	45
A*0201	ILSLELMKL	HMMR	Cancer	46, 47
A*0201	ALPFGFILV	IL13Ra	Cancer	30, 153
A*0201	ALMEQQHYV	ITGB8	Cancer	48
A*0201	VISNDVCAQV	KLK	Cancer	49
A*0201	FIYDFCIFGV	Lengsin	Cancer	50, 51
A*0201	QLCPICRAPV	LIVIN	Cancer	52, 53
A*0201	LLLASIAAGL	LY6K	Cancer	149
A*0201	SLLFLLFSL	MSLN	Cancer	54, 55, 173
A*0201	VLPLTVAEV	MSLN	Cancer	54, 55, 173
A*0201	AQCQETIRV	Midkine	Cancer	56
A*0201	SLFLGILSV	MS4A1	Cancer	57
A*0201	SLLMWITQC	NY-ESO-1	Cancer	58, 59, 60
A*0201	SLLMWITQV	NY-ESO-1	Cancer	60, 61
A*0201	YLYQWLGAPV	BGLAP	Cancer	154
A*0201	GLAPPQHLIRV	p53	Cancer	62, 63

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HLA Allele	Peptide	Antigen	Disease	Reference
A*0201	KLCPVQLWV	p53	Cancer	62, 63
A*0201	LLGRNSFEV	p53	Cancer	62, 63
A*0201	RMPEAAPPV	p53	Cancer	62, 63
A*0201	SLPPPGTRV	p53	Cancer	62, 63
A*0201	STPPPGTRV	p53	Cancer	64
A*0201	YLGSYGFRL	p53	Cancer	62, 63
A*0201	ELSDSLGPV	PASD1	Cancer	65
A*0201	QLLDGFMITL	PASD1	Cancer	66
A*0201	SIDWFMVTV	PLAC1	Cancer	67, 68
A*0201	VLQELNVTV	Pr1	Cancer	69, 70
A*0201	ALYVDSLFFL	PRAME	Cancer	71, 72, 73
A*0201	VLDGLDVLL	PRAME	Cancer	71, 72, 73
A*0201	YLQWIEFSI	Prominin1	Cancer	74
A*0201	FLTPKKLQCV	PSA	Cancer	75
A*0201	KLQCVDLHV	PSA	Cancer	76
A*0201	AILALLPAL	PSCA	Cancer	77, 78
A*0201	MMNDQLMFL	PSMA	Cancer	79, 80
A*0201	VLAGGFFLL	PSMA	Cancer	79, 80
A*0201	ALWPWLLMAT	RNF43	Cancer	81
A*0201	RLAEYQAYI	SART3	Cancer	82, 83
A*0201	MLAVFLPIV	STEAP1	Cancer	84
A*0201	TLPPAWQPFL	Survivin	Cancer	5, 85
A*0201	LMLGEFLKL	Survivin	Cancer	24, 86
A*0201	LTLGEFLKL	Survivin-3a	Cancer	87

Published human cancer T-cell epitopes

Version 1. October 2021

HLA Allele	Peptide	Antigen	Disease	Reference
A*0201	YLIELIDRV	TACE	Cancer	88
A*0201	FLFLRNFSL	TARP	Cancer	89, 90
A*0201	FLPSPLFFFL	TARP 2M	Cancer	89, 90
A*0201	ALLTSRLRFI	Telomerase	Cancer	91
A*0201	ILAKFLHWL	Telomerase	Cancer	92, 93, 94
A*0201	YLQVNSLQTV	Telomerase	Cancer	95, 96
A*0201	RLSSCVPVA	TGFβ	Cancer	97, 98
A*0201	FLYDDNQRV	topII	Cancer	14
A*0201	LLLLTVLTV	Mucin	Cancer	99, 100
A*0201	RMFPNAPYL	WT1	Cancer	101, 102, 103, 106
A*0201	SLGEQQYSV	WT1	Cancer	103, 104, 106
A*0201	VLDFAPPGA	WT1	Cancer	105, 106
A*0201	IMDQVPFSV	gp100	Melanoma	37, 107
A*0201	ITDQVPFSV	gp100	Melanoma	108, 109
A*0201	KTWGQYWQV	gp100	Melanoma	108, 109, 148
A*0201	GLYDGMEHL	MAGE-10	Melanoma	110, 111
A*0201	FLWGPRALV	MAGE-3	Melanoma	112, 113
A*0201	GVYDGREHTV	MAGE-4	Melanoma	114, 115, 116
A*0201	KVLEYVIKV	MAGE-A1	Melanoma	117, 118, 119
A*0201	YLQLVFGIEV	MAGE-A2	Melanoma	120, 121
A*0201	KVAELVHFL	MAGE-A3	Melanoma	111, 122, 123, 124
A*0201	FLAMLKNTV	MAGE-C1	Melanoma	125, 126
A*0201	ELAGIGILTV	MART-1	Melanoma	120, 127, 128
A*0201	YMDGTMSQV	Tyrosinase	Melanoma	37, 129, 131

Published human cancer T-cell epitopes

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HLA Allele	Peptide	Antigen	Disease	Reference
A*0201	LLVPTCVFLV	Endosialin	Cancer	29, 191
A*0201	GMLGMVSGL	NRP-1	Cancer	29, 191
A*0201	SLFEPPPPG	PSMA	Cancer	192
A*0301	RIAAWMATY	BCL-2L1	Cancer	24
A*0301	ALLAVGATK	gp100	Cancer	132, 133
A*0301	RLGLQVRKNK	RhoC	Cancer	24, 134
A*0301	RISTFKNWPK	Survivin-3a	Cancer	4, 135, 136
A*0301	YMVPFIPLYR	Tyrosinase	Melanoma	137
A*2402	DYLQYVLQI	BCL-2A1	Cancer	138, 139
A*2402	EYRALQLHL	Carbonic anhydrase	Cancer	140
A*2402	EYYELFVNI	DEP DC1	Cancer	141, 142, 143
A*2402	IYTWIEDHF	FOXM1	Cancer	142, 144, 149, 150
A*2402	EYILSLEEL	Glypican 3	Cancer	145, 146
A*2402	VYFFLPDHL	gp100	Cancer	147, 148
A*2402	KWLISPVKI	HJURP	Cancer	149, 150
A*2402	VYLRVRPLL	KIF20A	Cancer	151, 160, 161
A*2402	RYCNLEGPPI	LY6K	Cancer	155, 156
A*2402	EYCPGGNLF	MELK	Cancer	149, 150
A*2402	VYGIRLEHF	CDCA1	Cancer	157, 158, 159
A*2402	DYLNEWGSRF	p-Cadherin	Cancer	151, 160, 161
A*2402	CYASGWGSI	PSA	Cancer	162, 163
A*2402	AYACNTSTL	Survivin	Cancer	87, 164, 165, 166
A*2402	SYRNEIAYL	TTK	Cancer	167, 168

Published human cancer T-cell epitopes

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HLA Allele	Peptide	Antigen	Disease	Reference
A*2402	CYTWNQMNL	WT1	Cancer	169, 170, 171
A*2402	AFLPWHRLF	Tyrosinase	Melanoma	172, 173
A*6801	TVSGNILTIR	NY-ESO-1	Cancer	174
B*0702	APRGVRMAV	CAMEL	Cancer	175
B*0702	TPNQRQNVC	P2X5a	Cancer	176, 177
B*0702	RVRFFFPSL	MAGE-A1	Melanoma	178, 179
B*0702	LPWHRLFLL	Tyrosinase	Melanoma	137
B*3501	MPFATPMEA	NY-ESO-1	Cancer	180, 181, 182, 184
B*3501	EAAGIGILTY	MART-1	Melanoma	183
B*3501	MPFATPMEAEL	NY-ESO-1	Melanoma	10, 184
B*5101	MPFATPMEA	NY-ESO-1	Cancer	185
DPB1*0401	SLLMWITQCFLPVF	NY-ESO	Cancer	186, 187, 188
DPB1*0401	TQHFVQENYLEY	MAGE-A3	Cancer	189, 190

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