

T cell receptor therapeutics: immunological targeting of the intracellular cancer proteome

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Antigen class	Year	Target antigen	HLA restriction	Peptide	Variable region	Constant region	CDR modification	Co-receptor independent	vector	Conditioning	Disease	Phase	n, ORR (%)	Clinical trial #	PMID Ref	
Tissue differentiation	2006	MART-1	A*02:01	AAGIGILTV	Human	Human	None	No	RV	Flu/Cy	Mel	I/II	4/31 (13%)	NCT00091104	PMID: 16946036; PMID: 19451549	
	2009	MART-1	A*02:01	AAGIGILTV	Human	Human	None	Yes	RV	Flu/Cy	Mel	II	6/20 (30%)	NCT00509288	PMID: 19451549	
	2014	MART-1	A*02:01	AAGIGILTV	Human	Human	None	Yes	RV	Flu/Cy	Mel	II	0/8 (0%)	NCT00910650	PMID: 24634374	
	2022	MART-1	A*02:01	AAGIGILTV	Human	Murine	None	Yes	RV	Flu/Cy	Mel	I/II	2/11 (18%)	NCT02654821	PMID: 35865122	
	2009	gp100	A*02:01	KTWGGYVQVQ	Mouse	Mouse	None	Yes	RV	Flu/Cy	Mel	II	3/16 (19%)	NCT00509496	PMID: 19451549	
	2017	Tyrosinase	A*02:01	YMDGTMQSV	Human	Human	None	Yes	LV	Flu/Cy	Mel	I	1/3 (33%)	NCT01586403	PMID: 29052782	
	2011	CEA	A*02:01	IMIGVLVGV	Mouse	Mouse	Yes	Yes	RV	Flu/Cy	CRC	I	1/3 (33%)	NCT00923806	PMID: 21157437	
	2017	AFP	A*02:01	FMNKFYIEI	Human	Human	Yes	ND	LV	Flu/Cy	Liver	I	1/18 (8%)	NCT03132792	NA	
	2021	Mesothelin	A*02:01	SLFLFLSL	Human	Human	None	Yes	LV	Flu/Cy	PDAC	I	ND	NCT04809766	NA	
Cancer germline	2014	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	RV	Flu/Cy	Mel	II	11/20 (55%)	NCT00670748	PMID: 25538264	
	2014	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	RV	Flu/Cy	Synovial	II	11/18 (61%)	NCT00670748	PMID: 25538264	
	2018	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Flu/Cy	Synovial	I/II	6/12 (50%)	NCT01343043	PMID: 29891538	
	2019	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Cy	Synovial	I/II	1/5 (20%)	NCT01343043	PMID: 31651363	
	2019	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	RV	Flu/Cy	Mix	II	2/10 (20%)	NCT01697527	PMID: 30573690	
	2016	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Flu/Cy	Myxoid/round cell liposarcoma	II	4/10 (40%)	NCT02992743	NA	
	2015	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Flu/Cy	Lung	I/II	ND	NCT02588612	NA	
	2019	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Flu/Cy	Myxoid/round cell liposarcoma	II	ND	NCT03967223	NA	
	2011	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Melphalan	Multiple myeloma	I/II	NA	NCT01352286	PMID: 26193344	
	2015	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	RV	Cy	Mix	I	3/7 (43%)	NCT02366546	PMID: 35768164	
	2013	NY-ESO-1	A*02:01	SLLMWITQC	Murine	Murine	No	Yes	RV	Flu/Cy	Mix	II	ND	NCT01967823	NA	
	2021	NY-ESO-1	A*02:01	SLLMWITQC	Human	Human	Yes	Yes	LV	Flu/Cu	Sarcoma	I	5/12 (42%)	NCT04318964	ASCO 2022	
	2018	MAGE-A1	A*02:01	KVLEYVIV	Human	"pairing enhanced"	No	ND	LV	Flu/Cy	Mix	I	ND	NCT0441100	NA	
	2020	MAGE-A1	A*02:01	KVLEYVIVK	Human	Human	No	Yes	RV	Flu/Cy	Mix	I/II	ND	NCT04639245	NA	
	2011	MAGE-A3/A9/A12	A*02:01	KVAELVHL	Mouse	Mouse	Yes	Yes	RV	Flu/Cy	Mix	I/II	5/9 (56%)	NCT01273181	PMID: 23377668	
														NCT01350401 and		
	2013	MAGE-A3	A*01:01	EVDPHGLY	Human	Human	Yes	ND	LV	Cy or melphalan	Mix	I	ND	NCT01352286	PMID: 23770775	
	2014	MAGE-A3	A*01:01	EVDPHGLY	Human	Human	No	Yes	RV	Flu/Cy	Mix	I/II	1/3 (33%)	NCT02153905	NA	
	2014	MAGE-A3/A6	DPB1*04:01	KKLLTQHVFQENYLEY	Human	Mouse	No	Yes	RV	Flu/Cy	Mix	I/II	4/17 (24%)	NCT02111850	PMID: 28809608	
	2017	MAGE-A3/A6	DPB1*04:01	KKLLTQHVFQENYLEY	Human	Mouse	No	Yes	RV	Flu/Cy	Mix	I	ND	NCT03139370	NA	
	2009	MAGE-A4	A*24:02	NYKRCFPI	Human	Human	None	No	RV (siTCR)	None	GEJ	I	0/7 (0%)	UMIN000002395	PMID: 25855804	
	2021	MAGE-A4	A*02:01	GVYDGREHTV	Human	Human	Yes	Yes	LV	Flu/Cy	Mix	I	9/38 (24%)	NCT03132922	PMID: 36624315	
	2017	MAGE-A4	A*02:01	GVYDGREHTV	Human	Human	Yes	Yes	LV	Flu/Cy	Synovial/Myxoid	II	16/47 (34%)	NCT04044768	NA	
	2019	MAGE-A4/CD8α	A*02:01	GVYDGREHTV	Human	Human	Yes	Yes	LV	Flu/Cy	Mix	I	8/22 (36%)	NCT04044859	NA	
	2021	MAGE-A4/CD8α	A*02:01	GVYDGREHTV	Human	Human	Yes	Yes	LV	Flu/Cy	GEJ	II	ND	NCT04752358	NA	
	2017	MAGE-A4/A8	A*02:01	KVLEHVVRV	Human	Human	No	No	LV	Flu/Cy	Mix	I	ND	NCT03247309	NA	
	2016	MAGE-A10	A*02:01	GLYDGMHL	Human	Human	Yes	ND	LV	Flu/Cy	Mix	I	0/10 (0%)	NCT02989064	PMID: 35372008	
2015	MAGE-A10	A*02:01	GLYDGMHL	Human	Human	Yes	ND	LV	Flu/Cy	Lung	I	1/11 (9%)	NCT02592577	PMID: 35086946		
2021	MAGE-C2	A*02:01	ALKDVEERV	Human	Human	No	No	RV	None	Mix	I/II	ND	NCT04729543	PMID: 28645940		
2018	PRAME	A*02:01	SLQLHLGL	Human	"pairing enhanced"	No	No	LV	Flu/Cy	Mix	I	8/16 (50%)	NCT03686124	SITC 2021		
2018	PRAME	A*02:01	VLDGLDVL	Human	Mouse	No	No	RV	None	Heme	I/II	ND	NCT03503968	NA		
2021	KK-LC-1 / CT83	A*01:01	NTDNNLAVY	Human	Murine	No	Yes	RV	Flu/Cy	Mix	I	ND	NCT05035407	PMID: 31455429		
Oversuppressed	2006	Wild type P53	A*02:01	LLGRNSFEV	Murine	Murine	No	Yes	RV	Flu/Cy	Mix	II	ND	NCT00393029	NA	
	2012	WT1	A*02:01	RMFPNAPYL	Human	Human	No	Yes	LV	None	AML	I/II	NA (NED)	NCT01640301	PMID: 31235963	
	2015	WT1	A*02:01	RMFPNAPYL	Human	Human	No	Yes	LV	Cy	Lung cancer	I/II	ND	NCT02408016	NA	
	2016	WT1	A*02:01	RMFPNAPYL	Human	Human	No	Yes	RV	not specified	AML	I/II	ND	NCT02770820	NA	
	2015	WT1	A*02:01	RMFPNAPYL	Human	Human	No	No	RV	Flu/Steroids	MDS/AML	I/II	ND	NCT02550535	NA	
	2021	WT1	A*02:01	VLDFAAPGA	Human	Human	No	Yes	TRAC TI	Flu/Cy	AML	I/II	ND	NCT05066165	PMID: 35138911	
Viral	2013	WT1	A*24:02	CMTWNOQMNLL	Human	Human	No	No	RV (siTCR)	None	MDS/AML	I	0/8 (0%)	UMIN000011519	PMID: 28860210	
	2017	HERV-E	A*11:01	ATFLGSLTWK	Human	Human	No	No	RV	Flu/Cy	RCC	I	ND	NCT03354390	NA	
	2019	HPV16 E6	A*02:01	THDILQCV	Human	Mouse	No	Yes	RV	Flu/Cy	HPV16+	I/II	2/12 (17%)	NCT02280811	PMID: 31408414	
	2021	HPV16 E7	A*02:01	YMLDLQPET	Human	Mouse	No	Yes	RV	Flu/Cy	HPV16+	I/II	6/12 (50%)	NCT02858310	PMID: 35587825	
2022	MCpYV T antigen	A*02:01	KLLEIAPNC	Human	Human	No	Yes	LV	None or Flu/Cy	Merkel cell polyomavirus+	I/II	0/5 (0%)	NCT03747484	ASCO 2022		
Neointigen	2018	RAS (G12D)	A*11:01	VVGAGGVGK	Mouse	Mouse	No	No	RV	Flu/Cy	Mix	I/II	ND	NCT03745326	NA	
	2018	RAS (G12V)	A*11:01	VVGAGGVGK	Mouse	Mouse	No	Yes	RV	Flu/Cy	Mix	I/II	ND	NCT03190941	NA	
	NA	RAS (G12D)	C*08:02	GADGVGKSA (TRBV5-6); GADGVGKSA (TCR10)	Human	Mouse	No	TRBV5-6 = yes; TRBV10-02 = no	RV	Cy	PDAC	II	NA	Single patient IND	PMID: 35648703	
	2018	TP53 (R175H)	A*02:01	HMTVEVRHC	Human	Mouse	No	Yes	RV	Flu/Cy	Mix	II	ND	NCT03412877	PMID: 35749374	
2018	Private	Various HLA-I	Various	Human	Mouse	No	variable	RV	Flu/Cy	Mix	II	ND	NCT03412877	NA		
2019	Public and private	Various HLA-I	Various	Human	Mouse	No	variable	RV	Gem/Cy or Epi	Mix	I	ND	NCT04520711	NA		
2019	Private	Various HLA-I	Various	Human	Human	No	variable	TRAC TI	Flu/Cy	Mix	I	0/16	NCT03970382	PMID: 36356599		
2022	Public, various	Various HLA-I	Various	Human	Mouse	No	variable	Sleeping beauty	Flu/Cy	Mix	I/II	ND	NCT05194735	NA		