

Supplementary table5: IFN- γ producing CD4⁺ MHC class II restricted epitopes of HPV45 antigenic proteins

MHC class II alleles	Position of Epitopes		Potential CD4 ⁺ epitopes ^a	Consensus percentile rank ^a	IFN- γ producing CD4 ⁺ epitopes (Potentiality/ value) ^b		
	Start	End			Hybrid method	Result	Score
E1							
HLA-DRB1*11:01	260	274	LDCKWGVLLILALLRY	0.98	SVM	POSITIVE	0.121
HLA-DRB1*08:04	306	320	RSSLAALYWYRTGIS	0.18	SVM	POSITIVE	0.326
HLA-DRB1*08:04	307	321	SSLAALYWYRTGISN	0.18	SVM	POSITIVE	0.062
HLA-DRB1*08:06	306	320	RSSLAALYWYRTGIS	0.54	SVM	POSITIVE	0.326
HLA-DRB1*08:06	307	321	SSLAALYWYRTGISN	0.54	SVM	POSITIVE	0.062
HLA-DRB5*01:05	575	589	RVTVFTFPFAFPFDK	0.62	SVM	POSITIVE	0.307
HLA-DRB5*01:05	576	590	VTVFTFPFAFPFDKN	0.62	SVM	POSITIVE	0.101
HLA-DRB5*01:05	578	592	VFTFPFAFPFDKNGN	0.62	SVM	POSITIVE	0.049
HLA-DRB5*01:01	575	589	RVTVFTFPFAFPFDK	0.62	SVM	POSITIVE	0.307
HLA-DRB5*01:01	576	590	VTVFTFPFAFPFDKN	0.62	SVM	POSITIVE	0.101
HLA-DRB5*01:01	578	592	VFTFPFAFPFDKNGN	0.62	SVM	POSITIVE	0.049
HLA-DRB1*07:01	573	587	ESRVTVFTFPFAFPF	0.74	SVM	POSITIVE	0.180
E2							
HLA-DRB1*03:09	132	146	DNCMNYVVWDSIYYM	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:09	133	147	NCMNYVVWDSIYYMT	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:09	134	148	CMNYVVWDSIYYMTE	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:09	135	149	MNYVVWDSIYYMTET	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:09	136	150	NYVVWDSIYYMTETG	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:09	137	151	YVVWDSIYYMTETGI	0.1	MERCI	POSITIVE	3
HLA-DRB1*03:01	135	149	MNYVVWDSIYYMTET	0.11	MERCI	POSITIVE	3
HLA-DRB1*03:01	132	146	DNCMNYVVWDSIYYM	0.12	MERCI	POSITIVE	3

HLA-DRB1*03:01	133	147	NCMNYVVWDSIYYMT	0.12	MERCI	POSITIVE	3
HLA-DRB1*03:01	134	148	CMNYVVWDSIYYMTE	0.12	MERCI	POSITIVE	3
HLA-DRB1*03:01	136	150	NYVVWDSIYYMTETG	0.12	MERCI	POSITIVE	3
HLA-DRB1*11:07	132	146	DNCMNYVVWDSIYYM	0.13	MERCI	POSITIVE	3
HLA-DRB1*11:07	133	147	NCMNYVVWDSIYYMT	0.13	MERCI	POSITIVE	3
HLA-DRB1*11:07	134	148	CMNYVVWDSIYYMTE	0.13	MERCI	POSITIVE	3
HLA-DRB1*11:07	135	149	MNYVVWDSIYYMTET	0.13	MERCI	POSITIVE	3
HLA-DRB1*11:07	136	150	NYVVWDSIYYMTETG	0.13	MERCI	POSITIVE	3
HLA-DRB1*11:07	137	151	YVVWDSIYYMTETGI	0.13	MERCI	POSITIVE	6
HLA-DRB1*03:05	132	146	DNCMNYVVWDSIYYM	0.35	MERCI	POSITIVE	3
HLA-DRB1*03:05	133	147	NCMNYVVWDSIYYMT	0.35	MERCI	POSITIVE	3
HLA-DRB1*03:05	134	148	CMNYVVWDSIYYMTE	0.35	MERCI	POSITIVE	3
HLA-DRB1*03:05	135	149	MNYVVWDSIYYMTET	0.35	MERCI	POSITIVE	3
HLA-DRB1*03:05	136	150	NYVVWDSIYYMTETG	0.35	MERCI	POSITIVE	3
HLA-DRB1*03:05	137	151	YVVWDSIYYMTETGI	0.35	MERCI	POSITIVE	3
HLA-DRB1*04:02	131	145	KDNCMNYVVWDSIYY	0.49	MERCI	POSITIVE	3
HLA-DRB1*04:02	132	146	DNCMNYVVWDSIYYM	0.49	MERCI	POSITIVE	3
HLA-DRB1*04:02	133	147	NCMNYVVWDSIYYMT	0.49	MERCI	POSITIVE	3
HLA-DRB1*04:02	134	148	CMNYVVWDSIYYMTE	0.49	MERCI	POSITIVE	6
HLA-DRB1*04:02	135	149	MNYVVWDSIYYMTET	0.49	MERCI	POSITIVE	3
HLA-DRB1*04:02	136	150	NYVVWDSIYYMTETG	0.49	MERCI	POSITIVE	3
HLA-DRB1*04:02	137	151	YVVWDSIYYMTETGI	0.49	MERCI	POSITIVE	3
HLA-DRB1*03:08	132	146	DNCMNYVVWDSIYYM	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:08	133	147	NCMNYVVWDSIYYMT	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:08	134	148	CMNYVVWDSIYYMTE	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:08	135	149	MNYVVWDSIYYMTET	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:08	136	150	NYVVWDSIYYMTETG	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:08	137	151	YVVWDSIYYMTETGI	0.6	MERCI	POSITIVE	3

HLA-DRB1*03:06	132	146	DNCMNYVVWDSIYYM	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:06	133	147	NCMNYVVWDSIYYMT	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:06	134	148	CMNYVVWDSIYYMTE	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:06	135	149	MNYVVWDSIYYMTET	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:06	136	150	NYVVWDSIYYMTETG	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:06	137	151	YVVWDSIYYMTETGI	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	132	146	DNCMNYVVWDSIYYM	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	133	147	NCMNYVVWDSIYYMT	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	134	148	CMNYVVWDSIYYMTE	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	135	149	MNYVVWDSIYYMTET	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	136	150	NYVVWDSIYYMTETG	0.6	MERCI	POSITIVE	3
HLA-DRB1*03:07	137	151	YVVWDSIYYMTETGI	0.6	MERCI	POSITIVE	3
HLA-DRB1*15:02	131	145	KDNCMNYVVWDSIYY	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	132	146	DNCMNYVVWDSIYYM	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	133	147	NCMNYVVWDSIYYMT	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	134	148	CMNYVVWDSIYYMTE	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	135	149	MNYVVWDSIYYMTET	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	136	150	NYVVWDSIYYMTETG	0.7	MERCI	POSITIVE	3
HLA-DRB1*15:02	137	151	YVVWDSIYYMTETGI	0.7	MERCI	POSITIVE	3
HLA-DRB1*03:01	137	151	YVVWDSIYYMTETGI	0.78	MERCI	POSITIVE	3
HLA-DRB1*04:08	133	147	NCMNYVVWDSIYYMT	0.81	MERCI	POSITIVE	3
HLA-DRB1*04:08	134	148	CMNYVVWDSIYYMTE	0.81	MERCI	POSITIVE	3
HLA-DRB1*04:08	135	149	MNYVVWDSIYYMTET	0.81	MERCI	POSITIVE	3
HLA-DRB1*04:08	136	150	NYVVWDSIYYMTETG	0.81	MERCI	POSITIVE	3
HLA-DRB1*04:08	137	151	YVVWDSIYYMTETGI	0.81	MERCI	POSITIVE	3
HLA-DRB1*11:28	131	145	KDNCMNYVVWDSIYY	0.85	MERCI	POSITIVE	3
HLA-DRB1*11:28	132	146	DNCMNYVVWDSIYYM	0.85	MERCI	POSITIVE	3
HLA-DRB1*11:28	133	147	NCMNYVVWDSIYYMT	0.85	MERCI	POSITIVE	3

HLA-DRB1*11:28	134	148	CMNYVVWDSIYYMTE	0.85	MERCI	POSITIVE	3
HLA-DRB1*11:28	135	149	MNYVVWDSIYYMTET	0.85	MERCI	POSITIVE	3
HLA-DRB1*11:28	136	150	NYVVWDSIYYMTETG	0.85	MERCI	POSITIVE	3
HLA-DRB1*11:28	137	151	YVVWDSIYYMTETGI	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	131	145	KDNCMNYVVWDSIYY	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	132	146	DNCMNYVVWDSIYYM	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	133	147	NCMNYVVWDSIYYMT	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	134	148	CMNYVVWDSIYYMTE	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	135	149	MNYVVWDSIYYMTET	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	136	150	NYVVWDSIYYMTETG	0.85	MERCI	POSITIVE	3
HLA-DRB1*13:05	137	151	YVVWDSIYYMTETGI	0.85	MERCI	POSITIVE	3
HLA-DRB1*04:02	153	167	EKTAACVSYWGVYYI	0.55	MERCI	POSITIVE	2
HLA-DRB1*04:02	154	168	KTAACVSYWGVYYIK	0.55	MERCI	POSITIVE	3
HLA-DRB1*04:02	155	169	TAACVSYWGVYYIKD	0.55	MERCI	POSITIVE	6
HLA-DRB1*04:02	156	170	AACVSYWGVYYIKDG	0.55	MERCI	POSITIVE	10
HLA-DRB1*04:02	157	171	ACVSYWGVYYIKDGD	0.55	MERCI	POSITIVE	3
HLA-DRB1*04:02	158	172	CVSYWGVYYIKDGDT	0.55	MERCI	POSITIVE	6
HLA-DRB1*08:01	156	170	AACVSYWGVYYIKDG	0.79	MERCI	POSITIVE	10
HLA-DRB1*08:01	157	171	ACVSYWGVYYIKDGD	0.79	MERCI	POSITIVE	18
HLA-DRB1*08:01	158	172	CVSYWGVYYIKDGDT	0.79	MERCI	POSITIVE	17
HLA-DRB1*08:01	160	174	SYWGVYYIKDGDTTY	0.79	MERCI	POSITIVE	17
HLA-DRB1*08:01	162	176	WGVYYIKDGDTTYV	0.79	SVM	POSITIVE	0.007
HLA-DRB1*07:03	181	195	ECEKYGNSNTWEVQY	0.77	SVM	POSITIVE	0.085
HLA-DRB1*07:03	182	196	CEKYGNSNTWEVQYG	0.77	SVM	POSITIVE	0.161
HLA-DRB1*07:03	183	197	EKYGNSNTWEVQYGG	0.77	SVM	POSITIVE	0.390
HLA-DRB1*07:03	184	198	KYGNSNTWEVQYGGN	0.77	SVM	POSITIVE	0.511
HLA-DRB1*07:03	185	199	YGNSNTWEVQYGGNV	0.77	SVM	POSITIVE	0.391
E4							

HLA-DRB1*01:02	9	23	TTRYPLLRLLLDSYNT	0.03	SVM	POSITIVE	0.349
HLA-DRB1*01:02	10	24	TRYPLLRLLLDSYNTP	0.03	MERCI	POSITIVE	1
HLA-DRB1*01:02	11	25	RYPLLRLLLDSYNTPP	0.03	MERCI	POSITIVE	1
HLA-DRB1*01:02	12	26	YPLLRLLLDSYNTPPR	0.03	MERCI	POSITIVE	1
HLA-DRB1*01:02	13	27	PLLRLLLDSYNTPPRR	0.03	MERCI	POSITIVE	1
HLA-DRB1*01:02	14	28	LLRLLLDSYNTPPRRP	0.03	MERCI	POSITIVE	1
HLA-DRB1*01:02	15	29	LRLLLDSYNTPPRRPP	0.03	MERCI	POSITIVE	1
HLA-DRB1*04:10	68	82	TRSCVQVQVTTKEGK	0.14	SVM	POSITIVE	0.010
HLA-DRB1*04:10	69	83	RSCVQVQVTTKEGKC	0.14	SVM	POSITIVE	0.151
HLA-DRB1*04:10	70	84	SCVQVQVTTKEGKCV	0.14	SVM	POSITIVE	0.217
HLA-DRB1*04:10	71	85	CVQVQVTTKEGKCVV	0.14	SVM	POSITIVE	0.252
HLA-DRB1*04:10	72	86	VQVQVTTKEGKCVVV	0.14	SVM	POSITIVE	0.239
HLA-DRB1*04:04	9	23	TTRYPLLRLLLDSYNT	0.24	SVM	POSITIVE	0.349
HLA-DRB1*04:04	10	24	TRYPLLRLLLDSYNTP	0.25	MERCI	POSITIVE	1
HLA-DRB1*11:28	6	20	VPVTTRYPLLRLLLDS	0.28	SVM	POSITIVE	0.356
HLA-DRB1*11:28	7	21	PVTTRYPLLRLLLDSY	0.28	SVM	POSITIVE	0.519
HLA-DRB1*11:28	8	22	VTRYPLLRLLLDSYN	0.28	SVM	POSITIVE	0.401
HLA-DRB1*11:28	9	23	TTRYPLLRLLLDSYNT	0.28	SVM	POSITIVE	0.349
HLA-DRB1*11:28	10	24	TRYPLLRLLLDSYNTP	0.28	MERCI	POSITIVE	1
HLA-DRB1*11:28	11	25	RYPLLRLLLDSYNTPP	0.28	MERCI	POSITIVE	1
HLA-DRB1*11:28	12	26	YPLLRLLLDSYNTPPR	0.28	MERCI	POSITIVE	1
HLA-DRB1*13:05	6	20	VPVTTRYPLLRLLLDS	0.28	SVM	POSITIVE	0.356
HLA-DRB1*13:05	7	21	PVTTRYPLLRLLLDSY	0.28	SVM	POSITIVE	0.519
HLA-DRB1*13:05	8	22	VTRYPLLRLLLDSYN	0.28	SVM	POSITIVE	0.401
HLA-DRB1*13:05	9	23	TTRYPLLRLLLDSYNT	0.28	SVM	POSITIVE	0.349
HLA-DRB1*13:05	10	24	TRYPLLRLLLDSYNTP	0.28	MERCI	POSITIVE	1
HLA-DRB1*13:05	11	25	RYPLLRLLLDSYNTPP	0.28	MERCI	POSITIVE	1
HLA-DRB1*13:05	12	26	YPLLRLLLDSYNTPPR	0.28	MERCI	POSITIVE	1

HLA-DRB1*04:04	11	25	RYPLLRLLLDSYNTPP	0.3	MERCI	POSITIVE	1
HLA-DRB1*04:04	12	26	YPLLRLLLDSYNTPPR	0.3	MERCI	POSITIVE	1
HLA-DRB1*04:10	9	23	TTRYPLLRLLLDSYNT	0.33	SVM	POSITIVE	0.349
HLA-DRB1*04:10	10	24	TRYPLLRLLLDSYNTP	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:10	11	25	RYPLLRLLLDSYNTPP	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:10	12	26	YPLLRLLLDSYNTPPR	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:10	13	27	PLLRLLLDSYNTPPRR	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:10	14	28	LLRLLDSYNTPPRRP	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:10	15	29	LRLLLDSYNTPPRRPP	0.33	MERCI	POSITIVE	1
HLA-DRB1*04:04	13	27	PLLRLLLDSYNTPPRR	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	9	23	TTRYPLLRLLLDSYNT	0.38	SVM	POSITIVE	0.349
HLA-DRB1*04:23	10	24	TRYPLLRLLLDSYNTP	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	11	25	RYPLLRLLLDSYNTPP	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	12	26	YPLLRLLLDSYNTPPR	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	13	27	PLLRLLLDSYNTPPRR	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	14	28	LLRLLDSYNTPPRRP	0.38	MERCI	POSITIVE	1
HLA-DRB1*04:23	15	29	LRLLLDSYNTPPRRPP	0.38	MERCI	POSITIVE	1
HLA-DRB1*11:01	9	23	TTRYPLLRLLLDSYNT	0.39	SVM	POSITIVE	0.349
HLA-DRB1*11:01	10	24	TRYPLLRLLLDSYNTP	0.44	MERCI	POSITIVE	1
HLA-DRB1*11:01	8	22	VTRYPLLRLLLDSYN	0.48	SVM	POSITIVE	0.401
HLA-DRB1*13:21	6	20	VPVTTRYPLLRLLLDS	0.55	SVM	POSITIVE	0.356
HLA-DRB1*13:21	7	21	PVTTYPLLRLLLDSY	0.55	SVM	POSITIVE	0.519
HLA-DRB1*13:21	8	22	VTRYPLLRLLLDSYN	0.55	SVM	POSITIVE	0.401
HLA-DRB1*13:21	9	23	TTRYPLLRLLLDSYNT	0.55	SVM	POSITIVE	0.349
HLA-DRB1*13:21	10	24	TRYPLLRLLLDSYNTP	0.55	MERCI	POSITIVE	1
HLA-DRB1*13:21	11	25	RYPLLRLLLDSYNTPP	0.55	MERCI	POSITIVE	1
HLA-DRB1*13:21	12	26	YPLLRLLLDSYNTPPR	0.55	MERCI	POSITIVE	1
HLA-DRB1*13:07	6	20	VPVTTRYPLLRLLLDS	0.59	SVM	POSITIVE	0.356

HLA-DRB1*13:07	7	21	PVTTRYPLLRLLDYSY	0.59	SVM	POSITIVE	0.519
HLA-DRB1*13:07	8	22	VTRYPLLRLLDYSYN	0.59	SVM	POSITIVE	0.231
HLA-DRB1*13:07	9	23	TTRYPLLRLLDYSYNT	0.59	SVM	POSITIVE	0.349
HLA-DRB1*13:07	10	24	TRYPLLRLLDYSYNTP	0.59	MERCI	POSITIVE	1
HLA-DRB1*13:07	11	25	RYPLLRLLDYSYNTPP	0.59	MERCI	POSITIVE	1
HLA-DRB1*13:07	12	26	YPLLRLLDYSYNTPPR	0.59	MERCI	POSITIVE	1
HLA-DRB1*15:01	9	23	TTRYPLLRLLDYSYNT	0.6	SVM	POSITIVE	0.349
HLA-DRB1*15:01	10	24	TRYPLLRLLDYSYNTP	0.62	MERCI	POSITIVE	1
HLA-DRB1*15:01	12	26	YPLLRLLDYSYNTPPR	0.62	MERCI	POSITIVE	1
HLA-DRB1*11:01	6	20	VPVTTRYPLLRLLDYS	0.63	SVM	POSITIVE	0.356
HLA-DRB1*11:01	7	21	PVTTRYPLLRLLDYSY	0.63	SVM	POSITIVE	0.519
HLA-DRB1*15:01	11	25	RYPLLRLLDYSYNTPP	0.64	MERCI	POSITIVE	1
HLA-DRB1*04:05	9	23	TTRYPLLRLLDYSYNT	0.65	SVM	POSITIVE	0.349
HLA-DRB1*04:05	10	24	TRYPLLRLLDYSYNTP	0.65	MERCI	POSITIVE	1
HLA-DRB1*04:05	11	25	RYPLLRLLDYSYNTPP	0.65	MERCI	POSITIVE	1
HLA-DRB1*15:01	13	27	PLLRLLDYSYNTPPRR	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	9	23	TTRYPLLRLLDYSYNT	0.73	SVM	POSITIVE	0.349
HLA-DRB1*04:08	10	24	TRYPLLRLLDYSYNTP	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	11	25	RYPLLRLLDYSYNTPP	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	12	26	YPLLRLLDYSYNTPPR	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	13	27	PLLRLLDYSYNTPPRR	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	14	28	LLRLLDYSYNTPPRRP	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:08	15	29	LRLLDYSYNTPPRRPP	0.73	MERCI	POSITIVE	1
HLA-DRB1*04:02	9	23	TTRYPLLRLLDYSYNT	0.76	SVM	POSITIVE	0.349
HLA-DRB1*04:02	10	24	TRYPLLRLLDYSYNTP	0.76	MERCI	POSITIVE	1
HLA-DRB1*04:02	11	25	RYPLLRLLDYSYNTPP	0.76	MERCI	POSITIVE	1
HLA-DRB1*04:02	12	26	YPLLRLLDYSYNTPPR	0.76	MERCI	POSITIVE	1
HLA-DRB1*04:02	13	27	PLLRLLDYSYNTPPRR	0.76	MERCI	POSITIVE	1

HLA-DRB1*04:02	14	28	LLRLLDSYNTPPRRP	0.76	MERCI	POSITIVE	1
HLA-DRB1*04:02	15	29	LRL LDSYNTPPRRPP	0.76	MERCI	POSITIVE	1
HLA-DRB1*04:05	12	26	YPLLRL LDSYNTPPR	0.77	MERCI	POSITIVE	1
HLA-DRB1*04:04	8	22	VTTRYPLLRL LDSYN	0.83	SVM	POSITIVE	0.401
HLA-DRB1*04:05	8	22	VTTRYPLLRL LDSYN	0.84	SVM	POSITIVE	0.401
HLA-DRB1*11:01	11	25	RYPLLRL LDSYNTPP	0.86	MERCI	POSITIVE	1
HLA-DRB1*11:01	12	26	YPLLRL LDSYNTPPR	0.89	MERCI	POSITIVE	1
E5							
HLA-DRB1*07:03	21	35	PLVQSVYVCAFAWLL	0.28	SVM	POSITIVE	0.213
HLA-DRB1*07:03	22	36	LVQSVYVCAFAWLLV	0.28	SVM	POSITIVE	0.538
HLA-DRB1*07:03	23	37	VQSVYVCAFAWLLVF	0.28	SVM	POSITIVE	0.254
HLA-DRB1*07:03	24	38	QSVYVCAFAWLLVFL	0.28	SVM	POSITIVE	0.461
HLA-DRB1*07:03	25	39	SVYVCAFAWLLVFLF	0.28	SVM	POSITIVE	0.339
HLA-DRB5*01:05	21	35	PLVQSVYVCAFAWLL	0.86	SVM	POSITIVE	0.213
HLA-DRB5*01:05	22	36	LVQSVYVCAFAWLLV	0.86	SVM	POSITIVE	0.538
HLA-DRB5*01:05	23	37	VQSVYVCAFAWLLVF	0.86	SVM	POSITIVE	0.254
HLA-DRB5*01:05	24	38	QSVYVCAFAWLLVFL	0.86	SVM	POSITIVE	0.461
HLA-DRB5*01:05	25	39	SVYVCAFAWLLVFLF	0.86	SVM	POSITIVE	0.339
HLA-DRB5*01:01	21	35	PLVQSVYVCAFAWLL	0.86	SVM	POSITIVE	0.213
HLA-DRB5*01:01	22	36	LVQSVYVCAFAWLLV	0.86	SVM	POSITIVE	0.538
HLA-DRB5*01:01	23	37	VQSVYVCAFAWLLVF	0.86	SVM	POSITIVE	0.254
HLA-DRB5*01:01	24	38	QSVYVCAFAWLLVFL	0.86	SVM	POSITIVE	0.461
HLA-DRB5*01:01	25	39	SVYVCAFAWLLVFLF	0.86	SVM	POSITIVE	0.339
E6							
HLA-DRB1*15:01	72	86	YSRIRELRYYNSVY	0.3	MERCI	POSITIVE	1
HLA-DRB1*04:10	72	86	YSRIRELRYYNSVY	0.42	MERCI	POSITIVE	1
HLA-DRB1*15:02	72	86	YSRIRELRYYNSVY	0.44	MERCI	POSITIVE	1
HLA-DRB1*04:23	72	86	YSRIRELRYYNSVY	0.54	MERCI	POSITIVE	1

HLA-DRB1*04:08	72	86	YSRIRELRYYSNSVY	1	MERCI	POSITIVE	1
L1							
HLA-DRB1*11:28	270	284	NVPHSDFMDIIRLHR	0.68	SVM	POSITIVE	0.055
HLA-DRB1*11:28	271	285	VPHSDFMDIIRLHRP	0.68	SVM	POSITIVE	0.110
HLA-DRB1*11:28	272	286	PHSDFMDIIRLHRPA	0.68	SVM	POSITIVE	0.447
HLA-DRB1*11:28	273	287	HSDFMIDIIRLHRPAL	0.68	MERCI	POSITIVE	1.000
HLA-DRB1*13:05	270	284	NVPHSDFMDIIRLHR	0.68	SVM	POSITIVE	0.055
HLA-DRB1*13:05	271	285	VPHSDFMDIIRLHRP	0.68	SVM	POSITIVE	0.110
HLA-DRB1*13:05	272	286	PHSDFMDIIRLHRPA	0.68	SVM	POSITIVE	0.447
HLA-DRB1*13:05	273	287	HSDFMIDIIRLHRPAL	0.68	MERCI	POSITIVE	1.000
L2							
HLA-DRB1*04:02	429	443	IGIHGTQYYLWPWYY	0.06	SVM	POSITIVE	0.626
HLA-DRB5*01:05	435	449	QYYLWPWYYYFPKKR	0.3	SVM	POSITIVE	0.647
HLA-DRB5*01:01	435	449	QYYLWPWYYYFPKKR	0.3	SVM	POSITIVE	0.647
HLA-DRB1*13:27	429	443	IGIHGTQYYLWPWYY	0.44	SVM	POSITIVE	0.626
HLA-DRB1*13:01	429	443	IGIHGTQYYLWPWYY	0.44	SVM	POSITIVE	0.626
HLA-DRB1*13:28	429	443	IGIHGTQYYLWPWYY	0.44	SVM	POSITIVE	0.626
HLA-DRB1*04:21	429	443	IGIHGTQYYLWPWYY	0.45	SVM	POSITIVE	0.626
HLA-DRB1*13:04	429	443	IGIHGTQYYLWPWYY	0.71	SVM	POSITIVE	0.626
HLA-DRB1*04:26	429	443	IGIHGTQYYLWPWYY	0.87	SVM	POSITIVE	0.253
E7							
HLA-DRB4*01:01	82	96	EDLRTLQQLFLSTLS	0.56	SVM	POSITIVE	0.179
HLA-DRB1*13:11	81	95	AEDLRTLQQLFLSTL	0.64	SVM	POSITIVE	0.214
HLA-DRB1*13:11	82	96	EDLRTLQQLFLSTLS	0.64	SVM	POSITIVE	0.179
HLA-DRB1*13:11	83	97	DLRTLQQLFLSTLSF	0.64	SVM	POSITIVE	0.037
HLA-DRB1*13:11	84	98	LRTLQQLFLSTLSFV	0.64	SVM	POSITIVE	0.264
HLA-DRB1*11:04	81	95	AEDLRTLQQLFLSTL	0.64	SVM	POSITIVE	0.214
HLA-DRB1*11:04	82	96	EDLRTLQQLFLSTLS	0.64	SVM	POSITIVE	0.179

HLA-DRB1*11:04	83	97	DLRTLQQLFLSTLSF	0.64	SVM	POSITIVE	0.037
HLA-DRB1*11:04	84	98	LRTLQQLFLSTLSFV	0.64	SVM	POSITIVE	0.264
HLA-DRB4*01:01	83	97	DLRTLQQLFLSTLSF	0.65	SVM	POSITIVE	0.037
HLA-DRB4*01:01	81	95	AEDLRTLQQLFLSTL	0.68	SVM	POSITIVE	0.214
HLA-DRB1*01:02	81	95	AEDLRTLQQLFLSTL	0.76	SVM	POSITIVE	0.214
HLA-DRB1*01:02	82	96	EDLRTLQQLFLSTLS	0.76	SVM	POSITIVE	0.179
HLA-DRB1*01:02	83	97	DLRTLQQLFLSTLSF	0.76	SVM	POSITIVE	0.037
HLA-DRB1*01:02	84	98	LRTLQQLFLSTLSFV	0.76	SVM	POSITIVE	0.264
HLA-DRB1*11:28	81	95	AEDLRTLQQLFLSTL	0.85	SVM	POSITIVE	0.214
HLA-DRB1*11:28	82	96	EDLRTLQQLFLSTLS	0.85	SVM	POSITIVE	0.179
HLA-DRB1*11:28	83	97	DLRTLQQLFLSTLSF	0.85	SVM	POSITIVE	0.037
HLA-DRB1*11:28	84	98	LRTLQQLFLSTLSFV	0.85	SVM	POSITIVE	0.264
HLA-DRB1*13:05	81	95	AEDLRTLQQLFLSTL	0.85	SVM	POSITIVE	0.214
HLA-DRB1*13:05	82	96	EDLRTLQQLFLSTLS	0.85	SVM	POSITIVE	0.179
HLA-DRB1*13:05	83	97	DLRTLQQLFLSTLSF	0.85	SVM	POSITIVE	0.037
HLA-DRB1*13:05	84	98	LRTLQQLFLSTLSFV	0.85	SVM	POSITIVE	0.264
HLA-DRB4*01:01	84	98	LRTLQQLFLSTLSFV	0.88	SVM	POSITIVE	0.264
HLA-DRB1*13:21	81	95	AEDLRTLQQLFLSTL	0.89	SVM	POSITIVE	0.214
HLA-DRB1*13:21	82	96	EDLRTLQQLFLSTLS	0.89	SVM	POSITIVE	0.179
HLA-DRB1*13:21	83	97	DLRTLQQLFLSTLSF	0.89	SVM	POSITIVE	0.037
HLA-DRB1*13:21	84	98	LRTLQQLFLSTLSFV	0.89	SVM	POSITIVE	0.264
HLA-DRB1*15:06	81	95	AEDLRTLQQLFLSTL	0.99	SVM	POSITIVE	0.214
HLA-DRB1*15:06	82	96	EDLRTLQQLFLSTLS	0.99	SVM	POSITIVE	0.179
HLA-DRB1*15:06	83	97	DLRTLQQLFLSTLSF	0.99	SVM	POSITIVE	0.037
HLA-DRB1*15:06	84	98	LRTLQQLFLSTLSFV	0.99	SVM	POSITIVE	0.116

Note: a IEDB consensus method for the prediction of CD4⁺ epitopes, lowest percentile rank (<1%) indicated good binding efficiency with restricted alleles; b INF-gamma producing epitopes by using machine learning hybrid method (MERCİ and SVM), the positive values indicated the INF producing CD4⁺ epitopes; the CD4⁺ epitopes overlapped the immunogenic CD8⁺ T cell epitopes regions were showed as gray color shaded region