Supplementary Tables and Figures

Supplementary Table 1: List of primarily assessed CTL from LASV proteins.

Proteins	Supertype	CD8 epitope	Comb	Antigenicity	Immunogenicity	Allergenicity	Toxicity
	A3	ALSLLAILK	1.4075	0.6543	0.06701	Yes	Non-Toxin
	A26	ATCGIIGLV	0.7889	1.3749	0.2936	No	Non-Toxin
	A24	AWGGRYIAL	0.9438	0.7332	0.2272	No	Non-Toxin
	B62	CGIIGLVAF	0.5494	1.4004	0.25738	No	Non-Toxin
	A26	ELQTLELNM	0.5672	1.0217	0.07177	Yes	Non-Toxin
	A26	EVMNIVLIA	0.7217	0.8534	0.17335	Yes	Non-Toxin
	A3	FMRMAWGGR	0.6038	1.3759	0.13511	Yes	Non-Toxin
	A26	GIIGLVAFL	1.345	0.831	0.20678	Yes	Non-Toxin
	A2	GLVAFLFLC	0.5899	0.6296	0.24865	Yes	Non-Toxin
	A24	HYIRVGNET	0.5295	1.0671	0.22042	No	Non-Toxin
	A2	IATCGIIGL	0.5835	0.8728	0.24875	Yes	Non-Toxin
	A24	IIGLVAFLF	1.2164	0.6187	0.16919	Yes	Non-Toxin
	B62	IQNTTWEDH	0.6624	0.9072	0.38073	Yes	Non-Toxin
	B27	IRVGNETGL	1.2965	0.896	0.18801	Yes	Non-Toxin
	A2	IVLIALSLL	0.7678	1.0364	0.01188	Yes	Non-Toxin
	A1	LSQRTRDIY	1.4055	1.537	0.19748	Yes	Non-Toxin
Glycoprotein	A24	LTLTNTSII	0.6105	1.4017	0.00384	Yes	Non-Toxin
	A1	LTNTSIINH	0.6904	0.5084	0.10968	No	Non-Toxin
	A2	MAWGGRYIA	0.5263	0.8327	0.26236	Yes	Non-Toxin
	B27	MRMAWGGRY	1.6178	1.4318	0.28881	Yes	Non-Toxin
	B58	MSIISTFHL	1.6282	0.7085	0.17026	No	Non-Toxin
	B44	NETGLELTL	1.8776	1.1067	0.14347	Yes	Non-Toxin
	A2	NIVLIALSL	0.6711	1.3192	0.06265	Yes	Non-Toxin
	A1	NTSIINHKF	1.5942	0.7174	0.10503	Yes	Non-Toxin
	B62	RMAWGGRYI	1.1424	1.2794	0.34201	No	Non-Toxin
	B7	RPSPIGYLG	0.6122	2.3297	0.08704	No	Non-Toxin
	A26	SPIGYLGLL	0.7317	1.0594	0.08538	Yes	Non-Toxin
	B62	SQRTRDIYI	0.7957	1.4609	0.2373	Yes	Non-Toxin
	B58	TTWEDHCQF	1.4906	0.7392	0.11152	No	Toxin
	A3	VAFLFLCGK	0.8968	0.7782	0.1047	No	Non-Toxin
	B62	VGNETGLEL	0.6115	0.5985	0.21749	No	Non-Toxin
	A2	VMNIVLIAL	1.0633	0.939	0.29676	Yes	Non-Toxin
	B58	YLIIQNTTW	1.6583	0.7739	0.11367	Yes	Non-Toxin
Matrix Protein	A2	SIVPTAPPA	0.5654	0.5903	0.06103	Yes	Non-Toxin
	B7	KPSIVPTAP	0.8544	1.1	0.1656	Yes	Non-Toxin
	B7	APPARTGEN	0.527	1.1219	0.20981	No	Non-Toxin
Ring Finger Protein	A1	TTPTAPSIR	0.536	0.9673	0.00126	Yes	Non-Toxin
	B7	APSIREANT	0.723	0.939	0.25411	Yes	Non-Toxin
	B44	FENRGLVEC	0.7557	1.228	0.16588	No	Non-Toxin
Z Protein	A2	SLIPDATHL	0.9906	0.5569	0.14213	Yes	Non-Toxin
	B7	RPSAVPTAP	1.0685	0.8673	0.07105	Yes	Non-Toxin
	B62	GDRTRPPPY	0.6183	1.4294	0.07998	No	Non-Toxin

Supplementary Table 2: List of predicted unique HTL epitopes from LASV proteins

Protein Name	Peptide ID	Peptide Sequence	IL4pred	IL10pred	IFNepitope
Glycoprotein		RPSPIGYLGLLSQRT	Non IL4 inducer	IL10 inducer	Positive
		YLGLLSQRTRDIYIS	Non IL4 inducer	IL10 inducer	Positive
		IGYLGLLSQRTRDIY	Non IL4 inducer	IL10 inducer	Positive
		PIGYLGLLSQRTRDI	Non IL4 inducer	IL10 inducer	Positive
		GYLGLLSQRTRDIYI	IL4 inducer	IL10 inducer	Positive
		PSPIGYLGLLSQRTR	Non IL4 inducer	IL10 inducer	Positive
		SPIGYLGLLSQRTRD	Non IL4 inducer	IL10 inducer	Positive
		ETGLELTLTNTSIIN	IL4 inducer	IL10 non-inducer	Negative
		NETGLELTLTNTSII	IL4 inducer	IL10 non-inducer	Negative
		KGNWDCIMTSYQYLI	IL4 inducer	IL10 inducer	Negative
		NWDCIMTSYQYLIIQ	IL4 inducer	IL10 inducer	Negative
		TGLELTLTNTSIINH	IL4 inducer	IL10 non-inducer	Negative
		GNWDCIMTSYQYLII	IL4 inducer	IL10 inducer	Negative
		GKISVQYNLSHSYAG	IL4 inducer	IL10 inducer	Negative
		NIVLIALSLLAILKG	Non IL4 inducer	IL10 inducer	Negative
		TFMRMAWGGRYIALD	IL4 inducer	IL10 inducer	Negative
		WDCIMTSYQYLIIQN	IL4 inducer	IL10 inducer	Negative
		EDHCQFSRPSPIGYL	IL4 inducer	IL10 inducer	Negative
		CIMTSYQYLIIQNTT	IL4 inducer	IL10 inducer	Negative
		TSYQYLIIQNTTWED	IL4 inducer	IL10 inducer	Negative
		MTSYQYLIIQNTTWE	IL4 inducer	IL10 inducer	Negative
		DCIMTSYQYLIIQNT	IL4 inducer	IL4 inducer	Negative
		STFHLSIPNFNQYEA	IL4 inducer	IL10 non-inducer	Negative
		QTFMRMAWGGRYIAL	IL4 inducer	IL10 inducer	Negative
		KISVQYNLSHSYAGD	IL4 inducer	IL10 inducer	Negative
		SYQYLIIQNTTWEDH	IL4 inducer	IL10 inducer	Negative
		IMTSYQYLIIQNTTW	IL4 inducer	IL10 inducer	Negative
		IALSLLAILKGLYNI	Non IL4 inducer	IL10 inducer	Positive
		QYLIIQNTTWEDHCQ	IL4 inducer	IL10 inducer	Negative
		YQYLIIQNTTWEDHC	IL4 inducer	IL10 inducer	Negative
		MSIISTFHLSIPNFN	IL4 inducer	IL10 non-inducer	Negative
		YDHALMSIISTFHLS	IL4 inducer	IL10 non-inducer	Negative
		DHALMSIISTFHLSI	IL4 inducer	IL10 non-inducer	Positive
		GVLQTFMRMAWGGRY	IL4 inducer	IL10 inducer	Positive
		YNLSHSYAGDAAEHC	IL4 inducer	IL10 non-inducer	Negative
		ALSLLAILKGLYNIA	Non IL4 inducer	IL10 inducer	Negative
		VLQTFMRMAWGGRYI	IL4 inducer	IL10 inducer	Negative
		NGVLQTFMRMAWGGR	IL4 inducer	IL10 inducer	Negative
		LSLLAILKGLYNIAT	Non IL4 inducer	IL10 inducer	Positive
		LYDHALMSIISTFHL	IL4 inducer	IL10 non-inducer	Positive
		SIISTFHLSIPNFNQ	IL4 inducer	IL10 inducer	Negative
		LMSIISTFHLSIPNF	IL4 inducer	IL10 non-inducer	Negative
		ISTFHLSIPNFNQYE	IL4 inducer	IL10 inducer	Negative
		NLYDHALMSIISTFH	IL4 inducer	IL10 non-inducer	Negative
		ALMSIISTFHLSIPN	IL4 inducer	IL10 non-inducer	Negative
		HALMSIISTFHLSIP	IL4 inducer	IL10 non-inducer	Negative
		IISTFHLSIPNFNQY	IL4 inducer	IL10 inducer	Negative
		KNLYDHALMSIISTF	IL4 inducer	IL10 non-inducer	Negative
		SLLAILKGLYNIATC	Non IL4 inducer	IL10 inducer	Negative
		LAILKGLYNIATCGI	Non IL4 inducer	IL10 inducer	Positive
		MGQIITFFQEVPHVI	IL4 inducer	IL10 non-inducer	Positive
		GQIITFFQEVPHVIE	IL4 inducer	IL10 non-inducer	Positive
		QIITFFQEVPHVIEE	IL4 inducer	IL10 non-inducer	Positive
		AILKGLYNIATCGII	Non IL4 inducer	IL10 inducer	Positive
Matrix Protein		LCLNCLTLLLSVSSR	Non IL4 inducer	IL10 inducer	Negative
		LNCLTLLLSVSSRCP	Non IL4 inducer	IL10 inducer	Negative
		NCLTLLLSVSSRCPI	IL4 inducer	IL10 inducer	Negative
		YLCLNCLTLLLSVSS	Non IL4 inducer	IL10 inducer	Negative
Ring Finger Protein		CLNCLSLLLSVSSRC	Non IL4 inducer	IL10 inducer	Negative
		HYLCLNCLSLLLSVS	Non IL4 inducer	IL10 inducer	Negative
		LCLNCLSLLLSVSSR	Non IL4 inducer	IL10 non-inducer	Negative
		NCLSLLLSVSSRCPI	IL4 inducer	IL10 inducer	Negative

	NHYLCLNCLSLLLSV	Non IL4 inducer	IL10 inducer	Negative
	NNHYLCLNCLSLLLS	Non IL4 inducer	IL10 inducer	Negative
	YLCLNCLSLLLSVSS	Non IL4 inducer	IL10 non-inducer	Negative
	CLNCLTLLLSVSNRC	Non IL4 inducer	IL10 inducer	Positive
	CLTLLLSVSNRCPIC	IL4 inducer	IL10 inducer	Negative
	LCLNCLTLLLSVSNR	Non IL4 inducer	IL10 inducer	Negative
Z Protein	LNCLTLLLSVSNRCP	Non IL4 inducer	IL10 inducer	Negative
	LTLLLSVSNRCPICK	IL4 inducer	IL10 inducer	Negative
	NCLTLLLSVSNRCPI	IL4 inducer	IL10 inducer	Negative
	YLCLNCLTLLLSVSN	Non IL4 inducer	IL10 inducer	Negative

Supplementary Table 3: List of predicted unique LBL epitopes from LASV proteins

Protein Name	Peptide Sequence	Probability	Allergenicity	Antigenicity	Toxicity
Glycoprotein	TKNSSHHYIRVG	0.8017	Non-allergen	Non-antigen	Non-Toxin
	GKSCSLTLKGGY	0.8007	Non-allergen	Antigen	Non-Toxin
	SCTKNSSHHYIR	0.781	Non-allergen	Non-antigen	Non-Toxin
	MPLSCTKNSSHH	0.7402	Non-allergen	Antigen	Non-Toxin
	NSSHHYIRVGNE	0.7354	Non-allergen	Antigen	Non-Toxin
	PLSCTKNSSHHY	0.7351	Non-allergen	Antigen	Non-Toxin
	TMPLSCTKNSSH	0.7346	Non-allergen	Antigen	Non-Toxin
	SHHYIRVGNETG	0.732	Non-allergen	Antigen	Non-Toxin
	SSHHYIRVGNET	0.7267	Non-allergen	Antigen	Non-Toxin
	KSCSLTLKGGYE	0.72	Non-allergen	Antigen	Non-Toxin
	KNSSHHYIRVGN	0.7192	Non-allergen	Antigen	Non-Toxin
	SLTLKGGYELQT	0.6739	Non-allergen	Antigen	Non-Toxin
	LTLKGGYELQTL	0.6488	Non-allergen	Antigen	Non-Toxin
	CTKNSSHHYIRV	0.6018	Non-allergen	Non-antigen	Non-Toxin
	CSLTLKGGYELQ	0.5791	Non-allergen	Antigen	Non-Toxin
	GQIITFFQEVPH	0.5494	Allergen	Non-antigen	Non-Toxin
	KGGYELQTLELN	0.5471	Allergen	Antigen	Non-Toxin
	CGKSCSLTLKGG	0.5381	Non-allergen	Antigen	Non-Toxin
	TFFQEVPHVIEE	0.5298	Non-allergen	Non-antigen	Non-Toxin
	LKGLYNIATCGI	0.5144	Non-allergen	Non-antigen	Non-Toxin
	SCSLTLKGGYEL	0.5048	Non-allergen	Antigen	Non-Toxin
Matrix Protein	QTKAPEVEDGPR	0.7863	Allergen	Antigen	Non-Toxin
	TKAPEVEDGPRA	0.7481	Allergen	Antigen	Non-Toxin
	KQTKAPEVEDGP	0.7259	Non-allergen	Antigen	Non-Toxin
	MGNKQTKAPEVE	0.7178	Non-allergen	Antigen	Non-Toxin
	GNKQTKAPEVED	0.714	Allergen	Antigen	Non-Toxin
	NKGLVECNNHYL	0.704	Allergen	Non-antigen	Toxin
	KGLVECNNHYLC	0.6963	Non-allergen	Antigen	Toxin
	NKQTKAPEVEDG	0.6896	Allergen	Antigen	Non-Toxin
	KAPEVEDGPRAS	0.6703	Allergen	Antigen	Non-Toxin
	ASLIPDATHLGP	0.6624	Allergen	Antigen	Non-Toxin
	PQFCKSCWFENK	0.6603	Allergen	Antigen	Non-Toxin
	ECNNHYLCLNCL	0.6346	Non-allergen	Antigen	Toxin
	APEVEDGPRASL	0.6165	Non-allergen	Antigen	Non-Toxin
	ENKGLVECNNHY	0.5906	Non-allergen	Antigen	Toxin
	VECNNHYLCLNC	0.5681	Non-allergen	Antigen	Toxin
	DGPRASLIPDAT	0.5651	Allergen	Non-antigen	Non-Toxin
	WFENKGLVECNN	0.545	Non-allergen	Antigen	Toxin
	CNNHYLCLNCLT	0.5347	Non-allergen	Antigen	Toxin
	ATHLGPQFCKSC	0.5334	Non-allergen	Antigen	Non-Toxin
	LIPDATHLGPQF	0.5333	Non-allergen	Antigen	Non-Toxin
	SLIPDATHLGPQ	0.5127	Allergen	Antigen	Non-Toxin
	PDATHLGPQFCK	0.5105	Allergen	Antigen	Non-Toxin
Ring Finger Protein	NRGLVECNNHYL	0.7868	Allergen	Antigen	Toxin
	RGLVECNNHYLC	0.7743	Non-allergen	Antigen	Toxin
	DSPRASLIPDAS	0.7699	Non-allergen	Non-antigen	Non-Toxin
	VDSPRASLIPDA	0.7615	Allergen	Non-antigen	Non-Toxin
	ENRGLVECNNHY	0.7585	Non-allergen	Antigen	Toxin
	WFENRGLVECNN	0.7579	Non-allergen	Antigen	Non-Toxin
	CWFENRGLVECN	0.7276	Non-allergen	Antigen	Toxin
	FENRGLVECNNH	0.7275	Allergen	Antigen	Toxin
	ASLIPDASHLGP	0.6883	Allergen	Antigen	Non-Toxin
	GNKQVRSMKKVD	0.6832	Non-allergen	Antigen	Non-Toxin
	SCWFENRGLVEC	0.6804	Non-allergen	Antigen	Non-Toxin
	KQVRSMKKVDSP	0.6774	Non-allergen	Non-antigen	Non-Toxin
	LIPDASHLGPQF	0.6532	Non-allergen	Antigen	Non-Toxin
	SLIPDASHLGPQ	0.6517	Allergen	Antigen	Non-Toxin
	NKQVRSMKKVDS	0.6469	Non-allergen	Non-antigen	Non-Toxin
	KSCWFENRGLVE	0.6369	Allergen	Antigen	Non-Toxin
	RSMKKVDSPRAS	0.6363	Non-allergen	Non-antigen	Non-Toxin
	ECNNHYLCLNCL	0.6346	Non-allergen	Antigen	Toxin
	QVRSMKKVDSPR	0.6142	Non-allergen	Non-antigen	Non-Toxin

	MGNKQVRSMKKV	0.6094	Non-allergen	Antigen	Non-Toxin
	DASHLGPQFCKS	0.608	Non-allergen	Non-antigen	Non-Toxin
	PQFCKSCWFENR	0.6042	Allergen	Antigen	Non-Toxin
	SPRASLIPDASH	0.6033	Non-allergen	Antigen	Non-Toxin
	ASHLGPQFCKSC	0.5914	Non-allergen	Antigen	Non-Toxin
	CKSCWFENRGLV	0.5861	Allergen	Antigen	Non-Toxin
	PDASHLGPQFCK	0.582	Non-allergen	Antigen	Non-Toxin
	VRSMKKVDSPRA	0.5764	Non-allergen	Non-antigen	Non-Toxin
	VECNNHYLCLNC	0.5681	Non-allergen	Antigen	Toxin
	PRASLIPDASHL	0.5636	Allergen	Antigen	Non-Toxin
	IPDASHLGPQFC	0.5333	Non-allergen	Antigen	Non-Toxin
	FCKSCWFENRGL	0.5176	Allergen	Antigen	Non-Toxin
	CNNHYLCLNCLS	0.5079	Allergen	Antigen	Toxin
Z Protein	APETKNSPRASL	0.7927	Non-allergen	Antigen	Non-Toxin
	KAPETKNSPRAS	0.7828	Non-allergen	Non-antigen	Non-Toxin
	AKAPETKNSPRA	0.752	Non-allergen	Non-antigen	Non-Toxin
	QAKAPETKNSPR	0.7159	Non-allergen	Non-antigen	Non-Toxin
	NKGLVECNNHYL	0.704	Allergen	Non-antigen	Toxin
	KGLVECNNHYLC	0.6963	Non-allergen	Antigen	Toxin
	TKNSPRASLIPD	0.6904	Non-allergen	Antigen	Non-Toxin
	ETKNSPRASLIP	0.6814	Non-allergen	Antigen	Non-Toxin
	MGNKQAKAPETK	0.6766	Non-allergen	Antigen	Non-Toxin
	ASLIPDATHLGP	0.6624	Allergen	Antigen	Non-Toxin
	PQFCKSCWFENK	0.6603	Allergen	Antigen	Non-Toxin
	PETKNSPRASLI	0.6525	Non-allergen	Antigen	Non-Toxin
	KNSPRASLIPDA	0.6386	Allergen	Antigen	Non-Toxin
	ECNNHYLCLNCL	0.6346	Non-allergen	Antigen	Toxin
	NSPRASLIPDAT	0.6318	Non-allergen	Non-antigen	Non-Toxin
	GNKQAKAPETKN	0.6061	Non-allergen	Antigen	Non-Toxin
	ENKGLVECNNHY	0.5906	Non-allergen	Antigen	Toxin
	VECNNHYLCLNC	0.5681	Non-allergen	Antigen	Toxin
	KQAKAPETKNSP	0.5552	Allergen	Antigen	Non-Toxin
	WFENKGLVECNN	0.545	Non-allergen	Antigen	Toxin
	CNNHYLCLNCLT	0.5347	Non-allergen	Antigen	Toxin
	ATHLGPQFCKSC	0.5334	Non-allergen	Antigen	Non-Toxin
	LIPDATHLGPQF	0.5333	Non-allergen	Antigen	Non-Toxin
	SPRASLIPDATH	0.5219	Non-allergen	Antigen	Non-Toxin
	SLIPDATHLGPQ	0.5127	Allergen	Antigen	Non-Toxin
	PDATHLGPQFCK	0.5105	Allergen	Antigen	Non-Toxin

Supplementary Table 4: Selected CTL epitopes with their respective binding alleles (Consensus: PR≤5)

CTL Epitopes	HLA Alleles
CGIIGLVAF	HLA-B*35:01,HLA-B*46:01,HLA-B*15:01,HLA-A*23:01,HLA-B*53:01,HLA-B*35:03
ATCGIIGLV	HLA-A*68:02,HLA-A*26:01,HLA-A*02:06,HLA-A*30:02,HLA-A*01:01
APPARTGEN	HLA-E*01:01
FENRGLVEC	HLA-B*40:02,HLA-B*40:01,HLA-B*18:01,HLA-B*44:02
GDRTRPPPY	HLA-A*30:01,HLA-A*29:02

Supplementary Table 5: Selected HTL epitopes with their respective binding alleles (NN_align: PR≤5)

HTL Epitopes	HLA Alleles
GYLGLLSQRTRDIYI	HLA-DRB1*01:01,HLA-DRB1*04:05,HLA-DRB1*07:01,HLA-DRB1*04:01,HLA-DRB5*01:01
GVLQTFMRMAWGGRY	HLA-DQA1*01:02/DQB1*06:02,HLA-DRB5*01:01,HLA-DRB1*09:01,HLA-DPA1*01/DPB1*04:01,HLA-DRB1*11:01
NCLSLLLSVSSRCPI	HLA-DRB1*04:04,HLA-DRB1*07:01,HLA-DRB1*15:01
CLNCLTLLLSVSNRC	HLA-DQA1*01:02/DQB1*06:02,HLA-DRB1*04:04,HLA-DRB1*04:01,HLA-DRB1*15:01
CLTLLLSVSNRCPIC	HLA-DRB1*04:04,HLA-DRB1*04:01,HLA-DRB1*15:01
LTLLLSVSNRCPICK	HLA-DRB1*04:04,HLA-DRB1*04:01,HLA-DRB1*15:01
NCLTLLLSVSNRCPI	HLA-DRB1*04:04,HLA-DRB1*04:01,HLA-DRB1*15:01
NCLTLLLSVSSRCPI	HLA-DRB1*04:04,HLA-DRB1*07:01,HLA-DRB1*04:01

Supplementary Table 6: Population coverage of T-cell epitopes predicted from LASV proteins

MHC Class I		MHC Class II		MHC Class I and II (combined)	
Regions	**Coverage**	**Regions**	**Coverage**	**Regions**	**Coverage**
American Samoa	69.66%	Algeria	58.18%	Algeria	58.18%
American Samoa Polynesian	69.66%	Algeria Arab	58.18%	Algeria Arab	58.18%
Argentina	41.04%	Argentina	41.67%	American Samoa	69.66%
Argentina Amerindian	41.04%	Argentina Amerindian	25.05%	American Samoa Polynesian	69.66%
Australia	61.06%	Argentina Caucasoid	60.70%	Argentina	65.61%
Australian Aborigines	50.63%	Australia	20.42%	Argentina Amerindian	55.81%
Australia Caucasoid	79.68%	Australian Aborigines	20.42%	Argentina Caucasoid	60.70%
Austria	82.28%	Austria	80.90%	Australia	69.01%
Austria Caucasoid	82.28%	Austria Caucasoid	80.90%	Australia Australian Aborigines	60.71%
Belgium	62.26%	Belarus	43.81%	Australia Caucasoid	79.68%
Belgium Caucasoid	62.26%	Belarus Caucasoid	43.81%	Austria	96.62%
Brazil	59.77%	Belgium	61.44%	Austria Caucasoid	96.62%
Brazil Amerindian	9.83%	Belgium Caucasoid	61.44%	Belarus	43.81%
Brazil Caucasoid	70.13%	Bolivia	50.02%	Belarus Caucasoid	43.81%
Brazil Mixed	64.67%	Bolivia Amerindian	50.02%	Belgium	85.45%
Bulgaria	67.73%	Borneo	38.38%	Belgium Caucasoid	85.45%
Bulgaria Caucasoid	66.87%	Borneo Austronesian	38.38%	Bolivia	50.02%
Bulgaria Other	76.54%	Brazil	41.85%	Bolivia Amerindian	50.02%
Burkina Faso	39.30%	Brazil Amerindian	26.81%	Borneo	38.38%
Burkina Faso Black	39.30%	Brazil Caucasoid	70.93%	Borneo Austronesian	38.38%
Cameroon	72.65%	Brazil Mixed	55.74%	Brazil	76.61%
Cameroon Black	72.65%	Brazil Mulatto	50.86%	Brazil Amerindian	34.00%
Cape Verde	84.36%	Bulgaria	48.59%	Brazil Caucasoid	91.32%
Cape Verde Black	84.36%	Bulgaria Caucasoid	48.59%	Brazil Mixed	84.36%
Central Africa	66.25%	Cameroon	22.38%	Brazil Mulatto	50.86%
Central African Republic	3.00%	Cameroon Black	22.38%	Bulgaria	83.41%
African Republic Black	3.00%	Canada	16.28%	Bulgaria Caucasoid	82.97%
Central America	7.01%	Canada Amerindian	16.28%	Bulgaria Other	76.54%
Chile	96.94%	Cape Verde	61.99%	Burkina Faso	39.30%
Chile Amerindian	97.18%	Cape Verde Black	61.99%	Burkina Faso Black	39.30%
Chile Mixed	54.40%	Central Africa	34.37%	Cameroon	78.77%
China	56.18%	Central African Republic	45.54%	Cameroon Black	78.77%
China Oriental	56.18%	Central African Black	45.54%	Canada	16.28%
Colombia	67.27%	Central America	27.42%	Canada Amerindian	16.28%
Colombia Amerindian	53.00%	Chile	53.06%	Cape Verde	94.06%
Colombia Black	48.03%	Chile Amerindian	70.08%	Cape Verde Black	94.06%
Colombia Mestizo	76.56%	Chile Mixed	37.54%	Central Africa	77.85%
Croatia	74.85%	China	48.78%	Central African Republic	47.17%
Croatia Caucasoid	74.85%	China Oriental	48.78%	Central African Republic Black	47.17%
Cuba	76.65%	Colombia	32.90%	Central America	32.50%
Cuba Caucasoid	73.18%	Colombia Amerindian	29.84%	Chile	98.56%
Cuba Mulatto	81.61%	Colombia Black	38.56%	Chile Amerindian	99.16%
Czech Republic	71.11%	Colombia Mestizo	45.39%	Chile Mixed	71.52%
Czech Republic Caucasoid	71.11%	Congo	38.41%	China	77.56%
East Africa	75.34%	Congo Black	38.41%	China Oriental	77.56%
East Asia	91.44%	Cook Islands	57.53%	Colombia	78.04%
Ecuador	1.55%	Cook Islands Polynesian	57.53%	Colombia Amerindian	67.02%
Ecuador Amerindian	1.55%	Costa Rica	17.19%	Colombia Black	68.07%
England	88.49%	Costa Rica Mestizo	17.19%	Colombia Mestizo	87.20%
England Caucasoid	88.49%	Croatia	47.09%	Congo	38.41%
Europe	90.69%	Croatia Caucasoid	47.09%	Congo Black	38.41%
Finland	78.19%	Cuba	75.50%	Cook Islands	57.53%
Finland Caucasoid	78.19%	Cuba Mixed	75.50%	Cook Islands Polynesian	57.53%

France	77.86%	Czech Republic	74.81%	Costa Rica	17.19%
France Caucasoid	77.86%	Czech Republic Caucasoid	76.78%	Costa Rica Mestizo	17.19%
Georgia	66.78%	Czech Republic Other	60.47%	Croatia	86.69%
Georgia Caucasoid	68.26%	Denmark	75.00%	Croatia Caucasoid	86.69%
Georgia Kurd	74.31%	Denmark Caucasoid	75.00%	Cuba	94.28%
Germany	77.04%	East Africa	43.90%	Cuba Caucasoid	73.18%
Germany Caucasoid	77.04%	East Asia	66.83%	Cuba Mixed	75.50%
Guatemala	7.01%	Ecuador	45.02%	Cuba Mulatto	81.61%
Guatemala Amerindian	7.01%	Ecuador Amerindian	45.02%	Czech Republic	92.72%
Guinea-Bissau	81.05%	England	84.26%	Czech Republic Caucasoid	93.29%
Guinea-Bissau Black	81.05%	England Caucasoid	84.26%	Czech Republic Other	60.47%
Hong Kong	67.55%	Equatorial Guinea	23.44%	Denmark	75.00%
Hong Kong Oriental	67.55%	Equatorial Guinea Black	23.44%	Denmark Caucasoid	75.00%
India	95.29%	Ethiopia	56.73%	East Africa	86.17%
India Asian	95.29%	Ethiopia Black	56.73%	East Asia	97.16%
Indonesia	36.55%	Europe	73.07%	Ecuador	45.87%
Indonesia Austronesian	36.55%	Fiji	75.74%	Ecuador Amerindian	45.87%
Iran	59.21%	Fiji Melanesian	75.74%	England	98.19%
Iran Persian	59.21%	Finland	47.15%	England Caucasoid	98.19%
Ireland Northern	77.65%	Finland Caucasoid	47.15%	Equatorial Guinea	23.44%
Ireland Northern Caucasoid	77.65%	France	75.85%	Equatorial Guinea Black	23.44%
Ireland South	78.16%	France Caucasoid	75.85%	Ethiopia	56.73%
Ireland South Caucasoid	78.16%	Gabon	41.78%	Ethiopia Black	56.73%
Israel	65.14%	Gabon Black	41.78%	Europe	97.49%
Israel Arab	69.53%	Georgia	63.25%	Fiji	75.74%
Israel Jew	69.13%	Georgia Caucasoid	63.25%	Fiji Melanesian	75.74%
Italy	78.68%	Germany	80.26%	Finland	88.47%
Italy Caucasoid	78.68%	Germany Caucasoid	80.26%	Finland Caucasoid	88.47%
Ivory Coast	51.89%	Greece	52.95%	France	94.65%
Ivory Coast Black	51.89%	Greece Caucasoid	52.95%	France Caucasoid	94.65%
Japan	85.94%	Guatemala	16.46%	Gabon	41.78%
Japan Oriental	85.94%	Guatemala Amerindian	16.46%	Gabon Black	41.78%
Jordan	47.29%	Guinea-Bissau	55.38%	Georgia	87.79%
Jordan Arab	47.29%	Guinea-Bissau Black	55.38%	Georgia Caucasoid	88.34%
Kenya	74.19%	India	62.19%	Georgia Kurd	74.31%
Kenya Black	74.19%	India Asian	62.19%	Germany	95.47%
Korea; South	92.05%	Indonesia	39.81%	Germany Caucasoid	95.47%
Korea; South Oriental	92.05%	Indonesia Austronesian	39.81%	Greece	52.95%
Macedonia	4.74%	Iran	49.86%	Greece Caucasoid	52.95%
Macedonia Caucasoid	4.74%	Iran Kurd	43.00%	Guatemala	22.31%
Malaysia	38.38%	Iran Persian	52.43%	Guatemala Amerindian	22.31%
Malaysia Austronesian	15.36%	Ireland Northern	84.77%	Guinea-Bissau	91.55%
Malaysia Oriental	43.22%	Ireland North Caucasoid	84.77%	Guinea-Bissau Black	91.55%
Mali	87.75%	Ireland South	84.18%	Hong Kong	67.55%
Mali Black	87.75%	Ireland South Caucasoid	84.18%	Hong Kong Oriental	67.55%
Martinique	22.56%	Israel	52.02%	India	98.22%
Martinique Black	22.56%	Israel Arab	54.33%	India Asian	98.22%
Mexico	94.32%	Israel Jew	51.51%	Indonesia	61.81%
Mexico Amerindian	95.92%	Italy	42.56%	Indonesia Austronesian	61.81%
Mexico Mestizo	91.90%	Italy Caucasoid	42.56%	Iran	79.55%
Mongolia	35.78%	Jamaica	23.44%	Iran Kurd	43.00%
Mongolia Oriental	35.78%	Jamaica Black	23.44%	Iran Persian	80.59%
Morocco	78.83%	Japan	61.04%	Ireland Northern	96.60%
Morocco Arab	79.46%	Japan Oriental	61.04%	Ireland Northern Caucasoid	96.60%
Morocco Caucasoid	78.58%	Jordan	49.63%	Ireland South	96.54%
New Caledonia	39.31%	Jordan Arab	49.63%	Ireland South Caucasoid	96.54%
New Caledonia Melanesian	39.31%	Kiribati	9.37%	Israel	83.27%
North Africa	73.22%	Kiribati Micronesian	9.37%	Israel Arab	86.08%

North America	94.67%	Korea; South	69.56%	Israel Jew	85.03%
Northeast Asia	57.95%	Korea; South Oriental	69.56%	Italy	87.76%
Oceania	50.71%	Lebanon	61.33%	Italy Caucasoid	87.76%
Oman	60.03%	Lebanon Arab	61.33%	Ivory Coast	51.89%
Oman Arab	60.03%	Macedonia	53.46%	Ivory Coast Black	51.89%
Pakistan	46.52%	Macedonia Caucasoid	53.46%	Jamaica	23.44%
Pakistan Asian	46.17%	Malaysia	46.02%	Jamaica Black	23.44%
Pakistan Mixed	47.02%	Malaysia Austronesian	43.17%	Japan	94.52%
Papua New Guinea	43.45%	Malaysia Oriental	59.72%	Japan Oriental	94.52%
New Guinea Melanesian	43.45%	Martinique	57.69%	Jordan	73.45%
Peru	30.18%	Martinique Black	57.69%	Jordan Arab	73.45%
Peru Amerindian	30.18%	Mexico	34.12%	Kenya	74.19%
Philippines	64.57%	Mexico Amerindian	24.26%	Kenya Black	74.19%
Philippines Austronesian	64.57%	Mexico Mestizo	44.36%	Kiribati	9.37%
Poland	74.08%	Mongolia	63.35%	Kiribati Micronesian	9.37%
Poland Caucasoid	74.08%	Mongolia Oriental	63.35%	Korea; South	97.58%
Portugal	69.04%	Morocco	59.12%	Korea; South Oriental	97.58%
Portugal Caucasoid	69.04%	Morocco Arab	58.83%	Lebanon	61.33%
Romania	73.56%	Morocco Caucasoid	62.42%	Lebanon Arab	61.33%
Romania Caucasoid	73.56%	Nauru	35.01%	Macedonia	55.67%
Russia	68.01%	Nauru Micronesian	35.01%	Macedonia Caucasoid	55.67%
Russia Caucasoid	15.36%	Netherlands	69.80%	Malaysia	66.74%
Russia Mixed	17.92%	Netherlands Caucasoid	69.80%	Malaysia Austronesian	51.90%
Russia Other	74.55%	New Caledonia	81.41%	Malaysia Oriental	77.13%
Russia Siberian	73.58%	New Caledonia Melanesian	81.41%	Mali	87.75%
Rwanda	28.06%	New Zealand	58.74%	Mali Black	87.75%
Rwanda Black	28.06%	New Zealand Polynesian	58.74%	Martinique	67.23%
Sao Tome and Principe	82.01%	Niue	33.74%	Martinique Black	67.23%
Sao Tome and Principe Black	82.01%	Niue Polynesian	33.74%	Mexico	96.26%
Saudi Arabia	52.21%	North Africa	54.28%	Mexico Amerindian	96.91%
Saudi Arabia Arab	52.21%	North America	74.55%	Mexico Mestizo	95.50%
Scotland	32.22%	Northeast Asia	48.78%	Mongolia	76.46%
Scotland Caucasoid	32.22%	Norway	84.00%	Mongolia Oriental	76.46%
Senegal	81.92%	Norway Caucasoid	84.00%	Morocco	91.34%
Senegal Black	81.92%	Oceania	50.58%	Morocco Arab	91.55%
Serbia	55.51%	Papua New Guinea	65.68%	Morocco Caucasoid	91.95%
Serbia Caucasoid	55.51%	New Guinea Melanesian	65.68%	Nauru	35.01%
Singapore	56.51%	Paraguay	0.00%	Nauru Micronesian	35.01%
Singapore Austronesian	52.31%	Paraguay Amerindian	0.00%	Netherlands	69.80%
Singapore Oriental	61.77%	Peru	24.25%	Netherlands Caucasoid	69.80%
South Africa	76.59%	Peru Amerindian	24.25%	New Caledonia	88.72%
South Africa Black	81.70%	Philippines	25.52%	New Caledonia Melanesian	88.72%
South Africa Other	50.66%	Philippines Austronesian	25.52%	New Zealand	58.74%
South America	86.18%	Poland	73.57%	New Zealand Polynesian	58.74%
South Asia	95.93%	Poland Caucasoid	73.57%	Niue	33.74%
Southeast Asia	86.61%	Portugal	63.70%	Niue Polynesian	33.74%
Southwest Asia	54.15%	Portugal Caucasoid	63.70%	North Africa	87.75%
Spain	89.35%	Russia	62.88%	North America	98.64%
Spain Caucasoid	89.35%	Russia Caucasoid	80.09%	Northeast Asia	78.47%
Sri Lanka	24.83%	Russia Other	81.07%	Norway	84.00%
Sri Lanka Asian	24.83%	Russia Siberian	62.16%	Norway Caucasoid	84.00%
Sudan	60.67%	Rwanda	31.61%	Oceania	75.64%
Sudan Arab	17.45%	Rwanda Black	31.61%	Oman	60.03%
Sudan Black	6.49%	Samoa	66.63%	Oman Arab	60.03%
Sudan Mixed	62.19%	Samoa Polynesian	66.63%	Pakistan	46.52%
Sweden	78.18%	Sao Tome and Principe	41.55%	Pakistan Asian	46.17%

Sweden Caucasoid	78.18%
Taiwan	68.52%
Taiwan Oriental	68.52%
Thailand	85.75%
Thailand Oriental	85.75%
Tunisia	70.56%
Tunisia Arab	70.56%
Turkey	0.00%
Turkey Caucasoid	0.00%
Uganda	74.22%
Uganda Black	74.22%
United Arab Emirates	11.08%
United Arab Emirates Arab	11.08%
United States	94.82%
United States Amerindian	68.63%
United States Asian	64.51%
United States Black	96.32%
United States Caucasoid	76.81%
United States Hispanic	71.66%
United States Mestizo	74.25%
United States Polynesian	84.08%
Venezuela	71.88%
Venezuela Amerindian	70.86%
Venezuela Caucasoid	9.18%
Venezuela Mestizo	7.84%
Vietnam	54.29%
Vietnam Oriental	54.29%
West Africa	78.47%
West Indies	77.46%
World	91.74%
Zambia	90.69%
Zambia Black	90.69%
Zimbabwe	87.85%
Zimbabwe Black	87.85%

Sao Tome and Principe Black	41.55%
Saudi Arabia	62.78%
Saudi Arabia Arab	62.78%
Scotland	81.68%
Scotland Caucasoid	81.68%
Senegal	16.83%
Senegal Black	16.83%
Singapore	52.80%
Singapore Austronesian	52.80%
Slovenia	69.20%
Slovenia Caucasoid	69.20%
South Africa	1.79%
South Africa Black	1.79%
South America	38.70%
South Asia	62.86%
Southeast Asia	48.58%
Southwest Asia	32.90%
Spain	67.84%
Spain Caucasoid	68.24%
Spain Other	6.30%
Sudan	39.78%
Sudan Mixed	39.78%
Sweden	79.27%
Sweden Caucasoid	79.27%
Taiwan	59.50%
Taiwan Oriental	59.50%
Thailand	54.92%
Thailand Oriental	54.92%
Tokelau	20.79%
Tokelau Polynesian	20.79%
Tonga	62.79%
Tonga Polynesian	62.79%
Tunisia	56.58%
Tunisia Arab	56.16%
Tunisia Berber	61.71%
Turkey	59.30%
Turkey Caucasoid	59.30%
Ukraine	50.64%
Ukraine Caucasoid	50.64%
United States	74.92%
United States Amerindian	42.06%
United States Asian	66.12%
United States Austronesian	49.00%
United States Black	51.10%
United States Caucasoid	78.12%
United States Hispanic	55.93%
United States Mestizo	54.52%
United States Polynesian	59.87%
Vietnam	41.38%
Vietnam Oriental	41.38%
West Africa	48.27%
West Indies	55.24%
World	68.15%
Zimbabwe	43.90%
Zimbabwe Black	43.90%

Pakistan Mixed	47.02%
Papua New Guinea	80.59%
Papua New Guinea Melanesian	80.59%
Paraguay	0.00%
Paraguay Amerindian	0.00%
Peru	47.11%
Peru Amerindian	47.11%
Philippines	73.62%
Philippines Austronesian	73.62%
Poland	93.15%
Poland Caucasoid	93.15%
Portugal	88.76%
Portugal Caucasoid	88.76%
Romania	73.56%
Romania Caucasoid	73.56%
Russia	88.13%
Russia Caucasoid	83.15%
Russia Mixed	17.92%
Russia Other	95.18%
Russia Siberian	90.00%
Rwanda	50.80%
Rwanda Black	50.80%
Samoa	66.63%
Samoa Polynesian	66.63%
Sao Tome and Principe	89.48%
Sao Tome and Principe Black	89.48%
Saudi Arabia	82.22%
Saudi Arabia Arab	82.22%
Scotland	87.58%
Scotland Caucasoid	87.58%
Senegal	84.96%
Senegal Black	84.96%
Serbia	55.51%
Serbia Caucasoid	55.51%
Singapore	79.48%
Singapore Austronesian	77.49%
Singapore Oriental	61.77%
Slovenia	69.20%
Slovenia Caucasoid	69.20%
South Africa	77.01%
South Africa Black	82.03%
South Africa Other	50.66%
South America	91.53%
South Asia	98.49%
Southeast Asia	93.11%
Southwest Asia	69.23%
Spain	96.57%
Spain Caucasoid	96.62%
Spain Other	6.30%
Sri Lanka	24.83%
Sri Lanka Asian	24.83%
Sudan	76.32%
Sudan Arab	17.45%
Sudan Black	6.49%
Sudan Mixed	77.23%
Sweden	95.48%

Sweden Caucasoid	95.48%
Taiwan	87.25%
Taiwan Oriental	87.25%
Thailand	93.58%
Thailand Oriental	93.58%
Tokelau	20.79%
Tokelau Polynesian	20.79%
Tonga	62.79%
Tonga Polynesian	62.79%
Tunisia	87.22%
Tunisia Arab	87.09%
Tunisia Berber	61.71%
Turkey	59.30%
Turkey Caucasoid	59.30%
Uganda	74.22%
Uganda Black	74.22%
Ukraine	50.64%
Ukraine Caucasoid	50.64%
United Arab Emirates	11.08%
United Arab Emirates Arab	11.08%
United States	98.70%
United States Amerindian	81.82%
United States Asian	87.98%
United States Austronesian	49.00%
United States Black	98.20%
United States Caucasoid	94.93%
United States Hispanic	87.51%
United States Mestizo	88.29%
United States Polynesian	93.61%
Venezuela	71.88%
Venezuela Amerindian	70.86%
Venezuela Caucasoid	9.18%
Venezuela Mestizo	7.84%
Vietnam	73.20%
Vietnam Oriental	73.20%
West Africa	88.86%
West Indies	89.91%
World	97.37%
Zambia	90.69%
Zambia Black	90.69%
Zimbabwe	93.18%
Zimbabwe Black	93.18%

Supplementary Table 7: Tertiary model prediction of the final vaccine construct

Parameters	Results
Number of predicted domains	6
Best template	1bxwA, p-value 5.39e-06
Overall uGDT (GDT)	354 (55)
Residues modeled	642(100%)
Positions predicted as disordered	51(7%)
Secondary structure	11%H, 40%E, 47%C
Solvent access	48%E, 25%M, 25%B

Supplementary Table 8: Tertiary structure refinement result of the final vaccine protein.

Model	GDT-HA	RMSD	MolProbity	Clash Score	Poor Rotamers	Rama Favored
Initial	1.0000	0.000	3.607	89.7	6.4	89.0
MODEL 1	0.9268	0.504	2.085	13.4	0.4	93.0
MODEL 2	0.9276	0.490	2.052	13.2	0.8	93.6
MODEL 3	0.9291	0.491	2.158	15.4	0.8	92.5
MODEL 4	0.9256	0.517	2.011	11.7	0.8	93.4
MODEL 5	0.9213	0.516	2.049	13.6	0.4	93.9

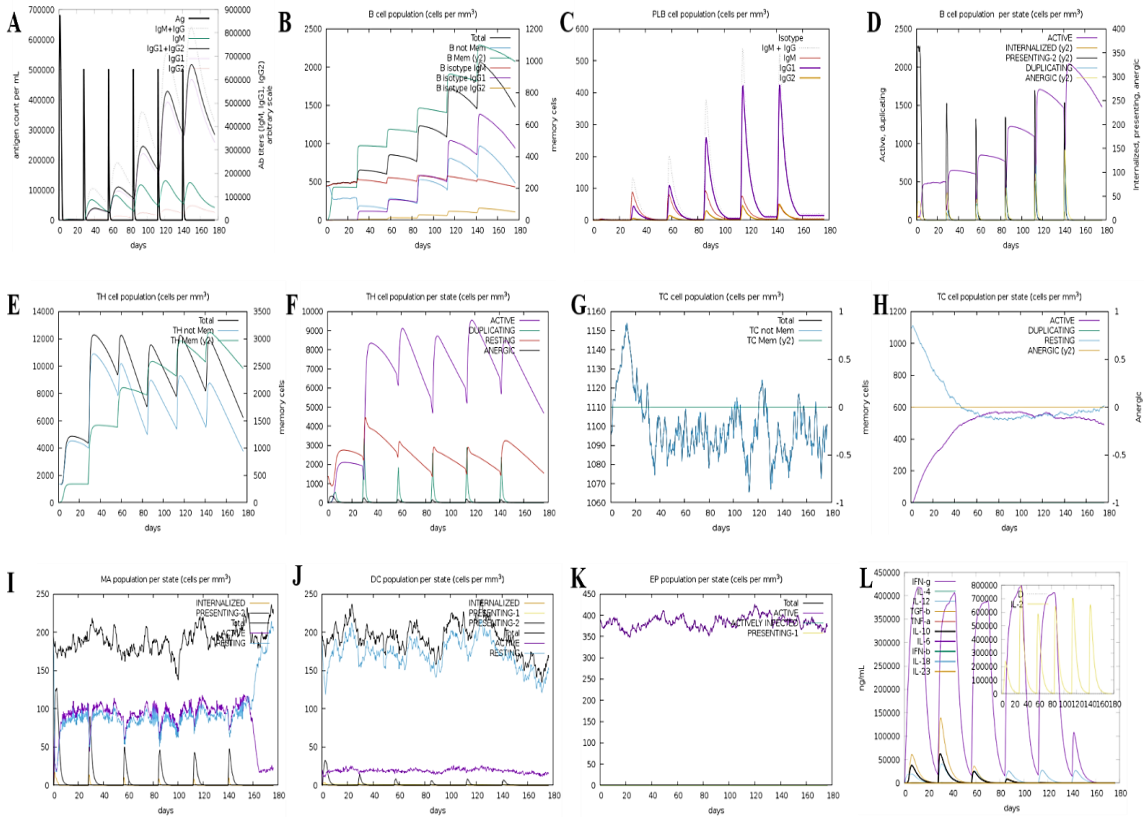
Supplementary Table 9: Disulfide engineering of the final multiepitope vaccine

Res1 Seq	Res1 AA	Res2 Seq	Res2 AA	Chi3	Energy	Sum B-Factors
11	ALA	19	ALA	85.64	0.98	0
20	GLN	74	ASP	119.73	3.62	0
21	ALA	172	ALA	118.79	2.46	0
23	PRO	71	GLN	-106.67	3.87	0
31	GLY	214	SER	73.25	5.11	0
37	ALA	208	SER	103.02	1.8	0
57	PHE	98	LYS	-108.43	4.3	0
65	GLY	83	ASP	67.2	6.49	0
67	PHE	81	GLY	-62.71	3.15	0
69	GLY	79	GLU	-87.91	1.73	0
77	ALA	116	LYS	-84.18	8.74	0
87	ARG	106	HIS	93.14	3.12	0
88	ALA	96	LYS	-84.22	2.35	0
90	VAL	95	PRO	107.88	4.04	0
110	GLY	136	VAL	-97.74	3.14	0
114	SER	130	ARG	96.01	4.09	0
118	SER	128	TYR	-85.77	2.53	0
122	LEU	125	LEU	115.98	4.21	0
185	TRP	207	GLY	-76.34	4.29	0
223	VAL	226	VAL	103.22	3.6	0
234	ASN	237	VAL	124.76	3.65	0
235	SER	342	ARG	-60.11	4.85	0
244	ALA	290	ARG	118.31	1.99	0
244	ALA	294	THR	112.6	3.49	0
246	LEU	250	ALA	88.88	3.9	0
265	LYS	350	GLY	-115.72	3.09	0
267	ALA	308	ALA	-108.82	4.36	0
272	ALA	345	GLU	126.91	6.81	0
276	ASP	338	LEU	118.77	2.19	0
280	SER	283	TYR	-96.05	3.35	0
289	GLN	313	GLY	71.38	5.17	0
296	ALA	311	ALA	118.42	4.29	0
305	ALA	308	ALA	126.12	4.6	0
314	HIS	317	ALA	113.18	3.47	0
319	PRO	322	GLY	-112.02	1.43	0
325	CYS	337	CYS	-74.33	1.93	0
330	GLY	333	ALA	83.97	4.26	0
385	GLY	388	GLY	81.52	2.97	0
402	ASN	404	ALA	121.31	2.53	0
422	ARG	426	TYR	114.09	2.19	0
434	LEU	449	GLY	112.41	4.11	0
457	PHE	463	GLY	-62.01	5.12	0
480	VAL	528	PRO	103.23	3.31	0
484	CYS	534	THR	71.78	4.51	0
488	PRO	491	GLY	-110.72	4.34	0
501	SER	504	CYS	100.29	1.39	0
501	SER	551	GLY	105.93	5.21	0
503	ARG	549	GLY	-110.85	4.42	0
533	LEU	559	SER	112.7	8.22	0
543	CYS	549	GLY	-111.13	4.3	0
565	CYS	569	GLY	-73.9	2.85	0
584	CYS	591	SER	122.69	5.01	0
584	CYS	618	PHE	79.69	2.79	0
592	CYS	626	CYS	-115.58	2.15	0

*The value of energy should be less than 2.2 and Chi3 should be in between −87 and +97 degree

Supplementary Table 10: Energy scores of the 30 vaccine-receptor docked complexes

Cluster	Members	Representative	Weighted Score
1	160	Center	-1276.8
	160	Lowest Energy	-1406
2	64	Center	-1253.5
	64	Lowest Energy	-1253.5
3	38	Center	-1095.8
	38	Lowest Energy	-1184.4
4	36	Center	-1262.5
	36	Lowest Energy	-1379.3
5	32	Center	-1026.7
	32	Lowest Energy	-1122.1
6	29	Center	-1257.5
	29	Lowest Energy	-1257.5
7	27	Center	-1288.7
	27	Lowest Energy	-1521.8
8	26	Center	-1295
	26	Lowest Energy	-1339.5
9	22	Center	-1030.8
	22	Lowest Energy	-1273.3
10	21	Center	-1066.3
	21	Lowest Energy	-1110.4
11	20	Center	-1065.4
	20	Lowest Energy	-1139.6
12	20	Center	-1185.6
	20	Lowest Energy	-1350.2
13	20	Center	-1119.4
	20	Lowest Energy	-1119.4
14	16	Center	-1029.8
	16	Lowest Energy	-1114.6
15	15	Center	-1093.4
	15	Lowest Energy	-1223.5
16	15	Center	-1185.5
	15	Lowest Energy	-1185.5
17	15	Center	-1147.4
	15	Lowest Energy	-1188.1
18	15	Center	-1128
	15	Lowest Energy	-1128
19	15	Center	-1068.9
	15	Lowest Energy	-1219.4
20	14	Center	-1030.8
	14	Lowest Energy	-1109.5
21	13	Center	-1065.8
	13	Lowest Energy	-1132.1
22	12	Center	-1234.5
	12	Lowest Energy	-1234.5
23	12	Center	-1172.3
	12	Lowest Energy	-1172.3
24	12	Center	-1105.4
	12	Lowest Energy	-1105.4
25	11	Center	-1148.6
	11	Lowest Energy	-1175.3
26	10	Center	-1130.6
	10	Lowest Energy	-1248.8
27	9	Center	-1090.6
	9	Lowest Energy	-1344.6
28	8	Center	-1032.7
	8	Lowest Energy	-1165
29	8	Center	-1129.6
	8	Lowest Energy	-1129.6
30	8	Center	-1092.6
	8	Lowest Energy	-1138



Supplementary Figure 1: Immune simulation of repeated antigen exposure using C-ImmSim server