

Supporting Information

Designing of Multi-Epitope Vaccine against the Structural Proteins of Marburg Virus Exploiting the Immunoinformatics Approach

Saad Ahmed Sami, ^a Kay Kay Shain Marma, ^a Shafi Mahmud, ^b Md. Asif Nadim Khan, ^c Sarah Albogami, ^d Ahmed M. El-Shehawi, ^d Ahmed Rakib, ^a Agnila Chakraborty, ^a Mostafah Mohiuddin, ^a Kuldeep Dhama, ^e Mir Muhammad Nasir Uddin, ^a Mohammed Kamrul Hossain, ^a Trina Ekawati Tallei, ^f Talha Bin Emran, ^{*g}

^aDepartment of Pharmacy, Faculty of Biological Sciences, University of Chittagong, Chittagong 4331, Bangladesh

^bMicrobiology Laboratory, Bioinformatics Division, Department of Genetic Engineering and Biotechnology, University of Rajshahi, Rajshahi 6205, Bangladesh

^cDepartment of Biochemistry and Molecular Biology, Faculty of Biological Sciences, University of Chittagong, Chittagong 4331, Bangladesh

^dDepartment of Biotechnology, College of Science, Taif University, P.O. Box 11099, Taif 21944, Saudi Arabia

^eDivision of Pathology, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh 243122, India

^fDepartment of Biology, Faculty of Mathematics and Natural Sciences, Sam Ratulangi University, Manado, North Sulawesi 95115, Indonesia

^gDepartment of Pharmacy, BGC Trust University Bangladesh, Chittagong 4381, Bangladesh

Running title: Multi-epitope vaccine design against MARV.

Table Legends

Table S1: Prediction of potential CTL epitopes from MARV structural proteins.

Table S2: Prediction of potential HTL epitopes from MARV structural proteins.

Table S3: Prediction of potential LBL epitopes from MARV structural proteins.

Table S4: Worldwide population coverage analysis based on MHC restriction data.

Table S5: Refined vaccine models generated by GalaxyRefine server.

Table S6: List of amino acid residues in disulfide engineering.

Figure Legends

Figure S1: Population coverage analysis of the shortlisted epitopes based on combined MHCI and MHCII restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.

Figure S2: Population coverage analysis of the shortlisted epitopes based on MHCI restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.

Figure S3: Population coverage analysis of the shortlisted epitopes based on MHCII restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.

Figure S4: (A) Solubility prediction of the vaccine protein by Protein-Sol server, (B) Composition of the secondary structure from amino acid residues of vaccine construct; (C) Predicted secondary structure of vaccine construct by SOPMA server, (D) Predicted secondary structure of vaccine construct by PSIPRED server, and (E) Predicted cart of the vaccine construct by PSIPRED server.

Figure S5: (A) 3D structure of the pre-refined vaccine construct, (B) Z-score of the pre-refined vaccine construct predicted by PROSA server, and (C) Ramachandran plot analysis of the pre-refined vaccine construct.

Table S1: Prediction of potential CTL epitopes from MARV structural proteins.

Epitopes	Protein	C-score	Immunogenicity	Antigenicity	Allergenicity	Toxicity
GSNDTELNY	L	2.1551	Positive	1.1545 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VSDIGSYDF	L	1.6327	Positive	1.0808 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
WTIGNRAPY	L	2.4674	Positive	1.2809 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LSDLTFLIS	L	1.1007	Positive	0.8669 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SKSTRTNHY	L	1.0416	Positive	1.0094 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FSLNQILEF	L	0.9996	Positive	0.4090 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RLAWTIGNR	L	1.4083	Positive	1.7779 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KLDFIRNTK	L	1.3402	Positive	0.4576 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HSGFIYFGK	L	1.3375	Positive	0.9309 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GLSFLNPEK	L	1.2918	Positive	1.2577 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ITFLRQTVR	L	1.1636	Positive	0.8009 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AMYLEDGFK	L	1.1434	Positive	0.4738 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QTHGIFTPR	L	1.0421	Positive	1.0543 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NLSDLTFLI	L	1.4496	Positive	1.3604 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YILFFPFGL	L	1.3987	Positive	1.1863 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FLTGLFPSL	L	1.3538	Positive	1.3390 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AVLDIALSL	L	1.2005	Positive	1.1816 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LLDLRNHFI	L	1.0733	Positive	1.3264 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FIKDRLTAV	L	2.0044	Positive	0.4056 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DYQTVLNFL	L	1.7646	Positive	0.4813 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KWKETDYLF	L	1.7160	Positive	1.7331 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LFDWMHFLI	L	1.5525	Positive	0.9236 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PYYWGMLLL	L	1.4739	Positive	1.2659 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

AYHYHLGGI	L	1.1865	Positive	1.2504 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
WYFVEHEPL	L	1.0715	Positive	0.6006 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DYQENAEAL	L	1.0288	Positive	0.7567 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LFGIADFVI	L	0.9705	Positive	0.6666 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VMFETFCVF	L	0.9107	Positive	0.5222 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NTINLGVAV	L	1.0689	Positive	1.0081 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LTTEGTMLM	L	1.0094	Positive	0.4855 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FPTIAAWTL	L	1.3265	Positive	0.4624 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LLESRRLIL	L	1.3330	Positive	0.4461 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
IGYILFFPF	L	1.0239	Positive	0.9160 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NPLWLDSVI	L	0.9757	Positive	0.5009 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YRVRNVQTL	L	1.5886	Positive	0.8591 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SRTEDKIGY	L	1.2665	Positive	1.3539 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GRLGRVSRS	L	1.0638	Positive	1.4659 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ARVAVELAI	L	1.0520	Positive	0.5899 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HRYTIPFSE	L	1.0433	Positive	0.4203 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NRAPYIGSR	L	0.9854	Positive	1.4659 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YHLGGIEGL	L	2.1229	Positive	0.6739 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AHHIPLISL	L	1.3198	Positive	0.9102 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HSMLAINLL	L	1.2105	Positive	0.7670 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LDYEGTLFL	L	1.0483	Positive	0.4798 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TEINARTRL	L	1.4761	Positive	1.0369 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EETFVHSGF	L	1.3617	Positive	0.5915 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KSLDAHEDF	L	1.7702	Positive	0.5138 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GTSETRHIF	L	1.0955	Positive	0.9338 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

IALITPQVL	L	0.9240	Positive	0.4927 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ILFFPFGLF	L	1.2137	Positive	0.7465 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YNLAFRYEF	L	0.9388	Positive	1.4719 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TFVHSGFIY	L	0.9217	Positive	0.5086 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QLSAIALGV	NP	1.1273	Positive	1.4299 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RFSGLLIVK	NP	1.0456	Positive	0.9051(Probable Antigen)	Probable Non-Allergen	Non-Toxin
HSLLELGTK	NP	0.9581	Positive	1.0804 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RPMNRPTAL	NP	1.9018	Positive	0.5629 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RPTALPPPV	NP	1.4121	Positive	0.9853 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
APFARVLNL	NP	1.3083	Positive	0.6130 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TPVEVTVQA	NP	0.9951	Positive	1.1606 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FDERRHVAM	NP	2.2254	Positive	0.9841 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HMKVIFGIL	NP	1.5964	Positive	0.7118 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YLRDAGYEF	NP	1.0941	Positive	0.5322 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QRGRIGLFL	NP	1.0594	Positive	1.1352 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TRMREAYEL	NP	0.9866	Positive	0.6250 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RRHEHQEIQ	NP	0.9027	Positive	0.6028 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HEHQEIQAI	NP	1.3818	Positive	0.7094 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LTLCVEHYYY	NP	1.0758	Positive	0.4200 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SQRGRIGLF	NP	1.4682	Positive	1.2966 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SNLARHGEY	NP	0.9614	Positive	0.4514 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FTYNLTNLV	VP40	1.2927	Positive	0.7288 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FTLEAIDI	VP40	1.1872	Positive	0.7009 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TQFTHNGQK	VP40	1.2120	Positive	0.6418 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TYNLTNLVL	VP40	1.2456	Positive	0.9020 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

VPAWLPLGI	VP40	1.1069	Positive	1.3515 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KGVPAWLPL	VP40	0.9815	Positive	0.6144 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FGLVAEAVL	VP24	1.0630	Positive	0.8115 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LALRILLGV	VP24	0.9151	Positive	0.6567 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EPFLALRIL	VP24	0.9280	Positive	0.7859 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
IEPFLALRI	VP24	1.0258	Positive	0.9800 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SESVVFLV	VP24	1.1188	Positive	0.9092 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SLIPGFRSI	VP24	0.9134	Positive	0.9273 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SPNLLGIYL	VP24	1.3490	Positive	0.8416 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RILLGVALK	VP24	1.5364	Positive	0.8602 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ISPNLLGIY	VP24	1.4959	Positive	1.0528 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GMTLLHHLK	VP24	1.2605	Positive	0.7035 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KQTYTGIHL	VP30	1.0350	Positive	1.5006 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SLTCAGIRK	VP30	1.1697	Positive	1.3530 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LTNRELLL	VP30	0.9198	Positive	1.1351 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TSLRAALSL	VP30	0.9648	Positive	0.6448 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KLDETSRA	VP30	1.0367	Positive	0.8875 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RQLHEITPV	VP35	1.0145	Positive	0.9367 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
IDKGWVCVY	VP35	0.9677	Positive	0.6472 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RTTAPAAAF	VP35	1.4688	Positive	0.4463 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RVTTEERTF	GP	0.9125	Positive	0.4840 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LTRWGGTCK	GP	1.1161	Positive	0.5523 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NRHAIDFLL	GP	0.9118	Positive	0.6969 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FGPGIEGLY	GP	0.9423	Positive	0.9714 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LSIAVLIAL	GP	1.0233	Positive	0.8765 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

LINRHAI	GP	0.9208	Positive	0.6824 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FSLINRHAI	GP	0.9750	Positive	0.8741 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AAGLSWIPF	GP	0.9285	Positive	1.4744 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LQKTEDVHL	GP	0.9366	Positive	1.2755 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
APSITTLPP	GP	1.0374	Positive	0.7789 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
MPPHNTTTI	GP	1.5292	Positive	0.7285 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QEDDLAAGL	GP	1.5205	Positive	1.2182 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NPHAQGIAL	GP	1.5028	Positive	1.0162 (Probable Antigen)	Probable Non-allergen	Non-Toxin
KSLELLLRV	GP	0.9784	Positive	0.8474 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NENDCDAEL	GP	1.2931	Positive	0.4489 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RRKRSILWR	GP	1.3644	Positive	0.6080 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
CFLISLILI	GP	1.1048	Positive	1.1174 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TQTNDTGCF	GP	1.2642	Positive	0.9573 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NIAAMIVNK	GP	1.1055	Positive	0.6257 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TGWGLGGKW	GP	0.9502	Positive	1.4104 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LLLSIAVLI	GP	1.2015	Positive	0.4430 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LLLSIAVL	GP	0.9613	Positive	0.7352 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

Table S2: Prediction of potential HTL epitopes from MARV structural proteins.

Epitopes	Protein	Antigenicity	Allergenicity	Toxicity	IFN	IL-4	IL-10
FILKFVLIHQGVNLV	NP	0.6203 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LRSSFILKFVLIHQG	NP	0.6923 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
RSSFILKFVLIHQGV	NP	0.6354 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
SFILKFVLIHQGVNL	NP	0.6155 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
SSFILKFVLIHQGVN	NP	0.4283 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NKKVILFDTNHQVSI	NP	0.7278 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
RNKKVILFDTNHQVS	NP	0.8340 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
VILFDTNHQVSICNQ	NP	0.4400 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
VRNKKVILFDTNHQV	NP	0.8619 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SPLILALKTLESTES	NP	0.9457 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
RGRIGLFLSFCSLFL	NP	0.4471 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
FSGLLIVKTVLEFIL	NP	0.4306 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LLIVKTVLEFILQKT	NP	0.4521 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
PLILALKTLESTESQ	NP	1.0059	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer

		(Probable Antigen)					
VIFGILRSSFILKFV	NP	0.4615 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
EQGIVTYPNHWLTTG	NP	0.4252 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
HMKVIFGILRSSFIL	NP	0.4892 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LILALKTLESTESQR	NP	0.9183 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
HYSPLILALKTLEST	NP	1.2143 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
YSPLILALKTLESTE	NP	1.0656 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
ILALKTLESTESQRG	NP	0.9847 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
PHYSPLILALKTLES	NP	1.1049 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KPTAPHVRNKKVILF	NP	1.0548 (Probable Antigen)	Probable Non-allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
AHDAEVKLQRRHEHQ	NP	0.9489 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
DAEVKLQRRHEHQEI	NP	1.0394 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
EVKLQRRHEHQEIQA	NP	1.0795 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
HDAEVKLQRRHEHQE	NP	0.9518 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
VKLQRRHEHQEIQAI	NP	1.1290 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

EHGLYPQLSAIALGV	NP	1.0417 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
HGLYPQLSAIALGVA	NP	1.0002 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
WLTTGHMKVIFGILR	NP	0.4260 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
FGILRSSFILKFVLI	NP	0.5364 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
QSFLNDPTPVEVTVQ	NP	0.4995 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
SFLNDPTPVEVTVQA	NP	0.6271 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SQSFLNDPTPVEVTV	NP	0.4197 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TVLEFILQKTDSGVT	NP	0.6168 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
VSQSFLNDPTPVEVT	NP	0.5328 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LEHGLYPQLSAIALG	NP	1.1370 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NLEHGLYPQLSAIAL	NP	1.1559 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
APFARVLNLSGINNL	NP	0.4896 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
DLPPPPLYAQEKQRQD	NP	1.2267 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ESQRGRIGLFLSFCS	NP	0.5304 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
LPPPPLYAQEKQRQDP	NP	1.2767	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

		(Probable Antigen)					
PPPLYAQEKRDPIQ	NP	1.1467 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
PPPPLYAQEKRDPI	NP	1.3443 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-inducer
QRGRIGLFLSFCSLF	NP	0.5802 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
SQRGRIGLFLSFCSL	NP	0.8219 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
YAPFARVLNLSGINN	NP	0.5169 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LQKTEITHSQTAVL	NP	0.7452 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
QKTEITHSQTAVLS	NP	0.8107 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
DDESEYTTDSQESID	NP	0.4147 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
HSLELGTKPTAPHV	NP	0.8374 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LGTKPTAPHVRNKKV	NP	1.3433 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LHSLELGTKPTAPH	NP	0.7611 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SLLELGTKPTAPHVR	NP	1.1247 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ALKTLESTESQRGRI	NP	0.6432 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LALKTLESTESQRGR	NP	1.0285 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

LKTLESTESQRGRIG	NP	1.0019 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
AKELQADWPDMSFDE	NP	0.8905 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ELQADWPDMSFDERR	NP	1.3503 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KELQADWPDMSFDER	NP	1.3021 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
VSAKELQADWPDMSF	NP	1.3703 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KTEITHSQTLAVLSQ	NP	0.6850 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SNFEYPLAHTVAALL	VP40	0.4400 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
NFEYPLAHTVAALLT	VP40	0.5362 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
YPLAHTVAALLTGSY	VP40	0.5020 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
GITPNYVGDLNLDDQ	VP40	1.2177 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ITPNYVGDLNLDDQF	VP40	1.1032 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NYVGDLNLDDQFKGN	VP40	0.7407 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PNYVGDLNLDDQFKG	VP40	0.9375 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
QGITPNYVGDLNLDD	VP40	0.9663 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TPNYVGDLNLDDQFK	VP40	0.8878	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer

		(Probable Antigen)					
YVGDNLDDQFKGNV	VP40	0.6878 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
HPAVSIHPNLPPIVL	VP40	1.0327 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
FPLNGFNRRQVVLAY	VP40	0.6541 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LNGFNRRQVVLAYAN	VP40	0.6950 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NFPLNGFNRRQVVLA	VP40	0.6309 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
PLNGFNRRQVVLAYA	VP40	0.5537 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
STNQFTYNLTNLVLS	VP40	0.4115 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TNQFTYNLTNLVLSV	VP40	0.4663 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
GVPAWLPLGIMSNFE	VP40	0.9261 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KGVPAWLPLGIMSNF	VP40	0.8517 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
PAWLPLGIMSNFEYP	VP40	1.0927 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
VKGVPAWLPLGIMSN	VP40	0.9631 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
VPWLPLGIMSNFEY	VP40	1.0258 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LGIMSNFEYPLAHTV	VP40	0.6167 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer

LPLGIMSNFEYPLAH	VP40	0.6376 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PLGIMSNFEYPLAHT	VP40	0.6427 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
MHPAVSIHPNLPPIV	VP40	1.0123 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
NTYMQYLNPPPYADH	VP40	0.6142 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
NYNTYMQYLNPPPYA	VP40	0.7003 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
YNTYMQYLNPPPYAD	VP40	0.6447 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
NRQVVLAYANPTLSA	VP40	0.8623 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
SNYNTYMQYLNPPPY	VP40	0.6456 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
NQFTYNLTNLVLSVQ	VP40	0.7212 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
FTYNLTNLVLSVQKL	VP40	0.7914 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
QFTYNLTNLVLSVQK	VP40	0.8980 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SSNYNTYMQYLNPPP	VP40	0.5525 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
AHPLRMLREGNQAFI	VP40	0.5379 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
HPLRMLREGNQAFIQ	VP40	0.4345 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
PLRMLREGNQAFIQN	VP40	0.4233	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer

		(Probable Antigen)					
FHILAQVLSKIAYKS	VP35	0.7346 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
DKGWVCVYSSEQGET	VP35	0.6287 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
GWVCVYSSEQGETRA	VP35	0.7019 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
IDKGWVCVYSSEQGE	VP35	0.6988 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
WVCVYSSEQGETRAL	VP35	0.4331 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
PFHILAQVLSKIAYK	VP35	0.6978 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
TPFHILAQVLSKIAY	VP35	0.4788 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
KIAYKSGKSGAFLDA	VP35	0.9643 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
SKIAYKSGKSGAFLD	VP35	1.0699 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
VLSKIAYKSGKSGAF	VP35	0.9713 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
EITPVLMGRTLEAI	VP35	0.9411 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
LKMGRTEAISKGMS	VP35	0.7925 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
PVLKMGRTEAISKG	VP35	0.5692 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
VLMGRTEAISKGM	VP35	0.5541 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

NNTPFHILAQVLSKI	VP35	0.4126 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
FKDLGVAQQACSKGT	VP35	0.9429 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PPQPAIFKDLGVAQQ	VP35	0.4261 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
EPFLALRILLGVALK	VP24	0.9143 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
FLALRILLGVALKDQ	VP24	1.1248 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
IEPFLALRILLGVAL	VP24	0.6630 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LALRILLGVALKDQE	VP24	1.2741 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
PFLALRILLGVALKD	VP24	1.1340 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
FVFHIPNTGMTLLHH	VP24	0.4556 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
GNFVHIPNTGMTLL	VP24	0.6285 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NFVHIPNTGMTLLH	VP24	0.6826 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TVKWGNFVHIPNTG	VP24	1.0717 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
WGNFVHIPNTGMTL	VP24	0.7569 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
TGMTLLHHLKSNFVV	VP24	0.6205 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
GMTLLHHLKSNFVVP	VP24	0.4513	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer

		(Probable Antigen)					
NTGMTLLHHLKSNFV	VP24	0.6872 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
IKLTGQQIIITRVNM	VP24	0.6071 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ESVVFGLVAEAVLRE	VP24	0.5288 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
HVVNDHGKPSIEIK	VP24	0.8888 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LHVVDHGKPSIEI	VP24	0.6198 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LSESVFGLVAEAVL	VP24	0.5214 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
SESVFGLVAEAVLR	VP24	0.5012 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TLHVVDHGKPSIE	VP24	0.4785 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
TVLSESVFGLVAEA	VP24	0.5868 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
VLSESVFGLVAEAV	VP24	0.5204 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
VVFGGLVAEAVLREHS	VP24	0.5622 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
AIHISPNLLGIYLT	VP24	1.1713 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
EVTSAIHISPNLLGI	VP24	1.2318 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
IHISPNLLGIYLTSD	VP24	1.0334 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

LEVTSAIHISPNTLLG	VP24	1.1628 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
SAIHISPNTLLGIYLT	VP24	1.2424 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
TSAIHISPNTLLGIYL	VP24	1.0230 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
HIPNTGMTLLHHLKS	VP24	0.5283 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
IPNTGMTLLHHLKSN	VP24	0.4539 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
PNTGMTLLHHLKSNF	VP24	0.5804 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
HISPNTLLGIYLTSDM	VP24	0.8902 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ISPNTLLGIYLTSDMF	VP24	0.6025 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
VRRIDIEPCCGETVL	VP24	0.5822 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LLEVTSAIHISPNTLL	VP24	0.9662 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KPHYTNYHPRARSMS	VP30	1.3278 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NYHPRARSMSSTRSS	VP30	1.2240 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
TNYHPRARSMSSTRS	VP30	1.1584 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
QFEAALWQGWDKRSI	VP30	0.4264 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
WQGWDKRSISLQVQA	VP30	0.6073	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

		(Probable Antigen)					
YTGHLDKGGQFEAA	VP30	0.7358 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LTNRELLLLMARKML	VP30	0.8097 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
NLTNRELLLLMARKM	VP30	1.1119 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NRELLLLMARKMLPN	VP30	0.4783 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
TNRELLLLMARKMLP	VP30	0.7001 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
EQTKDVLTLLENLGH	VP30	0.7558 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
QEQTkdVLTLENLGH	VP30	0.6791 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
QTKDVLTLLENLGHIL	VP30	0.6795 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TKDVLTLLENLGHILS	VP30	0.4267 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
VLTLLENLGHILSYLH	VP30	0.5886 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
DETSLRAALSLTCAG	VP30	0.9044 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ETSLRAALSLTCAGI	VP30	1.0964 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KLDETSLRAALSLTC	VP30	1.0843 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LDETSLRAALSLTCA	VP30	1.0235 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer

LENLGHILSYLHRSE	VP30	0.4423 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KRRIQLQIDFSDQV	L	0.5298 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
RRIQLQIDFSDQVG	L	0.8149 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
CFIMIKDVFIERYNT	L	0.7381 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SYECFIMIKDVFIER	L	0.8717 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KLPYRVRNVQTLAEA	L	0.7172 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PYRVRNVQTLAEALL	L	0.4011 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
YRVRNVQTLAEALLA	L	0.4393 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
QLKPILKILQRSLDL	L	0.6361 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
RLILNNLTIQITDIT	L	0.8099 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ALFHKVQSYVRQGKQ	L	0.4378 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
DLSIFIKDRLTAVNQ	L	0.8805 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
IFIKDRLTAVNQECW	L	0.9179 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
IISDLSIFIKDRLTA	L	0.4747 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ISDLSIFIKDRLTAV	L	0.9052	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer

		(Probable Antigen)					
LGYNPPVRFQSKRVP	L	0.5680 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LSIFIKDRLTAVNQE	L	0.9313 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SDLSIFIKDRLTAVN	L	0.8968 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SIFIKDRLTAVNQEC	L	0.8792 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ASFHSM LAINLLNQN	L	0.6923 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LQSTFRHELVLTRLA	L	0.4715 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
KEELFYILISKK PGL	L	0.7085 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
ELKTKLKLKSSVMGD	L	1.0699 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ITLVELKTKLKLKSS	L	1.6996 (Probable Antigen)	Probable Non-allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LKTKLKLKSSVMGDN	L	0.9807 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LKTKLKLKSSVMGDN	L	1.2587 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
QITLVELKTKLKLKS	L	1.7692 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
TLVELKTKLKLKSSV	L	1.2829 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
VELKTKLKLKSSVMG	L	1.4739 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer

QVGIFLICKAMSRQR	L	0.7663 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
VGIFLICKAMSRQRQ	L	0.7844 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
IGYILFFPFGLFKSG	L	0.4898 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
LNRVIGYILFFPFGL	L	0.4923 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NRVIGYILFFPFGLF	L	0.4308 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
RIQLQIDFSDQVGI	L	0.9520 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
NWSQLVEILPNMHSV	L	0.6075 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
QLVEILPNMHSVCIV	L	1.0083 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
SQLVEILPNMHSVCI	L	0.8440 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
VEILPNMHSVCIVHV	L	1.2109 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NFIKTIVQAKLTPQQ	L	0.4474 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
KETDYLLFFNTLATDS	L	0.5425 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-inducer
KWKETDYLLFFNTLAT	L	0.9008 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
WKETDYLLFFNTLATD	L	0.6457 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SHRSLRILQSTFRHE	L	0.4839	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer

		(Probable Antigen)					
EKLIALITPQVLGGL	L	0.4256 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ILGLDHFVSASARSQ	L	0.8159 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
KILGLDHFVSASARS	L	0.6893 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
NKILGLDHFVSASAR	L	0.6140 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LHLTPYLRQHIVSNS	L	0.6907 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
CLLEQFEVKWINLSE	L	1.1520 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
EQFEVKWINLSEDLR	L	1.2273 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FEVKWINLSEDLREQ	L	1.4122 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FGKLPYRVRNVQTLA	L	1.0330 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LEQFEVKWINLSEDL	L	0.9466 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LLEQFEVKWINLSED	L	0.8927 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
QFEVKWINLSEDLRE	L	1.3013 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
TFGKLPYRVRNVQTL	L	1.0412 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
RPSEGIRFKDNQKIT	L	0.9048 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer

GLFQLKNALEFLEKE	L	1.0254 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
SGLFQLKNALEFLEK	L	0.7677 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
LLWVTQGTADREKLL	L	0.5606 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
SRLWVTQGTADREK	L	0.7315 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
DYQTVLNFLPTHYSG	L	0.6046 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
KLIALITPQVLGGLS	L	0.6541 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TVLNFLPTHYSGNIV	L	0.6360 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
VLNFLPTHYSGNIVH	L	0.6307 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
YQTVLNFLPTHYSGN	L	0.4202 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
MLINTYKRDLHACFD	L	0.4845 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
GMLLLVHLSQLARRI	L	0.4521 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
NPYYWGMLLLVHLSQ	L	0.9319 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
PYYWGMLLLVHLSQL	L	0.8984 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
WGMLLLVHLSQLARR	L	0.8229 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
YWGMLLLVHLSQLAR	L	0.5977	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer

		(Probable Antigen)					
YYWGMLLL VHLSQLA	L	0.7248 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SMHYKLYDLLPPGKL	L	1.0052 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SSMHYKLYDLLPPGK	L	1.0296 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
VSSMHYKLYDLLPPG	L	1.0154 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
FSEKLIALITPQVLG	L	0.5543 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
RLLKLD FIRNTKIA	L	0.4594 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
DREKLLIPLLNSRVN	L	0.6049 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
REKLLIPLLNSRVNL	L	0.7482 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
KLDFIRNTKIAEQKL	L	0.4640 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LDFIRNTKIAEQKLL	L	0.4895 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LKLD FIRNTKIAEQK	L	0.6126 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LLKLD FIRNTKIAEQ	L	0.5074 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LLLKLD FIRNTKIAE	L	0.5702 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LTFSEKLIALITPQV	L	0.7316 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

DSNIIFQNTINLGVA	L	0.7090 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
IDSNIIFQNTINLGV	L	0.5326 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
IQRLQIDFSDQVGIF	L	0.7923 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LWEWYFVEHEPLFST	L	0.4470 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
WEWYFVEHEPLFSTK	L	1.1858 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SDLTFLISSTIRNLS	L	0.8938 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LLLVHLSQLARRIKG	L	0.4072 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LYNIDRLSALLESRR	L	0.6889 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
MLYNIDRLSALLESR	L	0.5064 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
LGFPPLGFNIDISCFK	L	1.1972 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
DILKLNLVIKAVEKG	L	0.9642 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
HILTSIQYDAINHVD	L	0.5914 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
ILKLNLVIKAVEKGGK	L	1.1904 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KLNLVIKAVEKGKNW	L	1.3819 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LKLNLVIKAVEKGKN	L	1.4523	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

		(Probable Antigen)					
LVIKAVEKGNWSQL	L	1.2680 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
NLVIKAVEKGNWSQ	L	1.1835 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LILNNTIQITDITN	L	1.0772 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ITTLSPIDAPNDY	L	0.4372 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
EETFVHSGFIYFGKK	L	0.9345 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ETFVHSGFIYFGKKQ	L	0.8698 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
KPEETFVHSGFIYFG	L	0.6669 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LKPEETFVHSGFIYF	L	0.7039 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PEETFVHSGFIYFGK	L	0.5338 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
TFVHSGFIYFGKKQY	L	1.1293 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
GFKLIKHLEPLCVSC	L	1.1223 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FKYLLPSELVKYANW	L	0.5906 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
IRNAVSLQASKPGLR	L	0.5861 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
ADYPLDVLGELYNQ	L	0.4137 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

ASKIILNSEINNLNL	L	0.4184 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
AVSLQASKPGLRIWY	L	0.4932 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
DCKELRLEGSNDTEL	L	0.5149 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
DGFKLIKHLEPLCVS	L	0.6625 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
EGTRLLASRTISLT	L	0.6673 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
FKLIKHLEPLCVSCI	L	1.0047 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
GTRLLASRTISLTT	L	0.6579 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
LLASRTISLTTEGTM	L	0.8657 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LRNHFICSLRGKITK	L	1.0056 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
NSPLDLRNHFICSL	L	1.1905 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
PYDCKELRLEGSNDT	L	0.4188 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
RTLLASRTISLTTEG	L	0.6082 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
SPLDLRNHFICSLR	L	1.4076 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
TLLASRTISLTTEGT	L	0.8180 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TRTLLASRTISLTTE	L	0.7087	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer

		(Probable Antigen)					
YNIDRLSALLESRRL	L	0.5492 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
ELVLTRLAHHIPLIS	L	0.5039 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
AIDSNIFQNTINLG	L	0.6330 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
DDLQGSLASIGTSFE	L	0.6209 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
DFKYLLPSELVKYAN	L	0.6683 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
DLQGSLASIGTSFER	L	0.6551 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
FQILIKSLDAHEDFD	L	0.6609 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
GSLASIGTSFERGTS	L	0.7559 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
KGQRGSLRSNWKFIG	L	1.2737 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LASIGTSFERGTSET	L	0.6789 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LASIGTSFERGTSET	L	1.0508 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
LSDLTFLISSTIRNL	L	0.8122 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
NQFCRFTGVVSSMHY	L	0.4115 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PFQILIKSLDAHEDF	L	0.5955 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer

QGSLASIGTSFERGT	L	0.7819 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
SLASIGTSFERGTSE	L	0.7704 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
SMLAINLLNQHLGF	L	1.2843 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
DLTFLISSTIRNLSH	L	0.9393 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FCRFTGVVSSMHYKL	L	0.6884 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FIKTIVQAKLTPQQY	L	0.5458 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FLISSTIRNLSHRSL	L	0.4867 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FQNTINLGVAVLDIA	L	0.9731 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
GLRIWYRDQNLTPYL	L	0.8444 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
INNFSCLMKKGQSSL	L	0.5785 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
KPGLRIWYRDQNLTP	L	1.0307 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LAINLLNQHLGFPL	L	1.1116 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LRIWYRDQNLTPYLC	L	0.5566 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
MLAINLLNQHLGFP	L	1.0856 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
RIWYRDQNLTPYLCD	L	0.4582	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

		(Probable Antigen)					
AQITLVELKTKLKLK	L	1.7562 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
CRFTGVVSSMHYKLY	L	0.7595 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FIYFGKKQYLNGVQL	L	1.0053 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
GFIYFGKKQYLNGVQ	L	0.8564 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
HSGFIYFGKKQYLNG	L	0.7544 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
HSMLAINLLNQHLG	L	0.9158 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KVQSYVRQGKQHLHS	L	0.4896 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NNFSCLMKKGQSSLP	L	0.7308 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
RFTGVVSSMHYKLYD	L	0.8414 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SGFIYFGKKQYLNGV	L	0.7480 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
VHSGFIYFGKKQYLN	L	1.0329 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
RHELVLTRLAHHIPL	L	0.4507 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
CAQITLVELKTKLKL	L	1.5301 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
FICSLRGKITKYND	L	0.4520 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer

HFICSLRGKITKYNN	L	0.7511 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
KLIKHLEPLCVSCIQ	L	1.0183 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NHFICSLRGKITKYY	L	0.5004 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
QFCRFTGVVSSMHYK	L	0.7152 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ARTRLINYGSTALQG	L	0.8501 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
EINARTRLINYGSTA	L	1.1732 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
ENITEINARTRLINY	L	0.8209 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
INARTRLINYGSTAL	L	1.1687 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
ITEINARTRLINYG	L	1.0891 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
LINYGSTALQGMDTK	L	0.9352 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NARTRLINYGSTALQ	L	1.0194 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
NITEINARTRLINYG	L	1.3096 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
RLINYGSTALQGMDT	L	0.8449 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
TEINARTRLINYGST	L	1.0864 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
TRLINYGSTALQGMD	L	0.8943	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

		(Probable Antigen)					
APYIGSRTEKIGYP	L	1.1625 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
ESLSLSRIKSIKNS	L	0.5600 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ILNNTIQITDITNP	L	0.8867 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NDILKLNLVKAVEK	L	0.5062 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
NIPSISLDPGFRSMS	L	1.1801 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
PYIGSRTEKIGYPP	L	1.3795 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SNIPSISLDPGFRSM	L	1.0491 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
YIGSRTEKIGYPPL	L	1.2768 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
FLRQTVRENITITSQ	L	0.6261 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
HLHSLMLDYENNSPL	L	0.7562 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
HSLMLDYENNSPLLD	L	0.6866 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
ITFLRQTVRENITIT	L	0.7998 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
KNHYHSQGSWYKTH	L	0.5863 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
KQHLHSLMLDYENNS	L	0.6466 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

LHSLMLDYENNSPLL	L	0.6861 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LMLDYENNSPLDLR	L	1.3298 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
PEFSSHTSSVSSNQQ	L	0.4991 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
QHLHSLMLDYENNSP	L	0.6963 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TFLRQTVRENITITS	L	0.4578 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer
LVLTRLAHHIPLISL	L	0.6962 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
AEKLEYLAPSYRNFS	L	1.1197 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
LAWTIGNRAPYIGSR	L	1.6783 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LGILLLLSIAVLIAL	GP	0.8179 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NLGILLLLSIAVLIA	GP	0.8845 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
ELRIWSVQEDDLAAG	GP	0.5290 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
ILIQGTKNLPIL	GP	0.7316 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
ISLILIQGTKNLPIL	GP	0.8795 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LISLILIQGTKNLPI	GP	0.7123 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LTNLGILLLLSIAVL	GP	0.9675	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

		(Probable Antigen)					
TNLGILLLLSIAVLI	GP	0.9041 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
AQHLVYFRRKRSILW	GP	1.0689 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
HLVYFRRKRSILWRE	GP	0.8434 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LVYFRRKRSILWREG	GP	0.7074 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
QHLVYFRRKRSILWR	GP	0.7222 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
SSTAQHLVYFRRKRS	GP	0.9310 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Inducer
STAQHLVYFRRKRSI	GP	0.9100 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TAQHLVYFRRKRSIL	GP	0.9311 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
AKTCYNISVTDPSGK	GP	0.8031 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
KTCYNISVTDPSGKS	GP	0.8654 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
YNISVTDPSGKSLLL	GP	0.5192 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
WGAFFLYDRIASTTM	GP	0.5262 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
VLTNLGILLLLSIAV	GP	0.7683 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
GILLLLSIAVLIALS	GP	0.6806 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer

ILLLSIAVLIALSC	GP	0.7238 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
NLVCRLRRLANQTAK	GP	0.4764 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
IKNQNNLVCRLRRLA	GP	0.8817 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
KNQNNLVCRLRRLAN	GP	0.7045 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
NQNNLVCRLRRLANQ	GP	0.4656 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
QNNLVCRLRRLANQT	GP	0.4044 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
FRRKRSILWREGDMF	GP	0.5102 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
VYFRRKRSILWREGD	GP	0.7696 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
YFRRKRSILWREGDM	GP	0.6284 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
CFLISLILIQGTKNL	GP	0.9344 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
FLISLILIQGTKNLP	GP	0.5244 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
KTTCFLISLILIQGT	GP	1.1974 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
MKTTCFLISLILIQG	GP	1.0715 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TCFLISLILIQGTKN	GP	0.9546 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
TTCFLISLILIQGTK	GP	0.9266 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer

		(Probable Antigen)					
LLLLSI AVLIALSCI	GP	0.8548 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LLLLSI AVLIALSCIC	GP	0.8659 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LLSI AVLIALSCICR	GP	0.6690 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
AAGLSWIPFFGPGIE	GP	0.6265 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
AGLSWIPFFGPGIEG	GP	0.6726 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
GLSWIPFFGPGIEGL	GP	0.6774 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
LAAGLSWIPFFGPGI	GP	0.6551 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LSWIPFFGPGIEGLY	GP	0.7821 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
SWIPFFGPGIEGLYT	GP	0.4479 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Non-Inducer
GVLTNLGILLLLSIA	GP	0.8302 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
LIQGTKNLPILEIAS	GP	0.5991 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
IQGTKNLPILEIASN	GP	0.5093 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Inducer	Inducer
SDWGVLTNLGILLLL	GP	0.9342 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
DWGVLTNLGILLLLS	GP	1.0409 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Positive	Non-Inducer	Non-Inducer

SKHNFSTLSAPLQNT	GP	0.4592 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Inducer
LIKNQNNLVCRLRRL	GP	0.5633 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
TSDWGVLTNLGILL	GP	0.8542 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
WTSDWGVLTNLGILL	GP	0.5321 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Non-Inducer	Non-Inducer
WWTSDWGVLTNLGIL	GP	0.5035 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Non-Inducer
NLPILEIASNNQPQN	GP	0.4484 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
KNLPILEIASNNQPQ	GP	0.6043 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer
LPILEIASNNQPQNV	GP	0.5485 (Probable Antigen)	Probable Non-Allergen	Non-Toxin	Negative	Inducer	Inducer

Table S3: Prediction of potential LBL epitopes from MARV structural proteins.

Epitopes	Protein	Probability Score	Antigenicity	Allergenicity	Toxicity
DGLINAPIDFDPVPNT	GP	0.9560	0.6448 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TGCFGALQEYNSTKNQ	GP	0.9815	0.5725 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PLEASKRWAFRTGVPP	GP	0.9861	0.6999 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EIKLTSTPTDATKLNT	GP	0.6717	0.9451 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NVEYTEGEEAKTCYNI	GP	0.9560	0.9577 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PPLPTARPEIKLTSTP	GP	0.9560	1.1812 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QGTKNLPILIASNNQ	GP	0.9825	0.5376 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SSTAQHLVYFRRKRSI	GP	0.7384	0.9044 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TKLNTTDPSSDDEDLA	GP	0.9560	0.6620 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AYSGENENDCDAELRI	GP	0.9560	0.8740 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NISVTDPSGKSLLLDP	GP	0.9560	0.5634 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GPGIEGLYTAVLIKNQ	GP	0.8288	0.6075 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GPATTAPNTTNEHFTS	GP	0.9560	0.6081 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TAKSTSSKKGPAATTAP	GP	0.9490	0.4867 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
APSITLPPPTGNPTTA	GP	0.9560	0.4666 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GLSSTMPPTPSPQPST	GP	0.9560	0.5977 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PSMPPHNTTITSTNNT	GP	0.9560	0.6622 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QKVADSPLEASKRWAF	GP	0.9994	0.7064 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SAEEDQHASPNISSLTL	GP	0.9560	1.0235 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SGTLQKTEDVHLMGFT	GP	0.9560	0.6914 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PNINENTAYSGENEND	GP	0.9560	0.4339 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RWAFRTGVPPKNVEYT	GP	0.7485	1.4651 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AELRIWSVQEDDLAAG	GP	0.4810	0.5106 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

SPNISLTLASYFPNINE	GP	0.9560	0.9563 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TSDAVTKQGLSSTMP	GP	0.9560	0.4301 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LSWIPFFGPGIEGLYT	GP	0.4091	0.7445 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GEEAKTCYNISVTDPS	GP	0.9560	1.0629 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TEERTFSLINRHAI	GP	0.9560	1.0356 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
CFLISLILIQGTKNLP	GP	0.7859	0.8087 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
WWTSDWGVLTNLGILL	GP	0.9560	0.4645 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LLLRVTTEERTFSLIN	GP	0.9560	0.8536 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EDDLAAGLSWIPFFGP	GP	0.8165	0.6954 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SQGSWYKTTTHDLHLTP	L	0.9560	1.0468 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ASARSQCEDFSPKENP	L	0.9560	1.2618 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VSCIQTHGIFTPRKYW	L	0.9560	0.4370 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ECFIMIKDVFIERYNT	L	0.9560	0.5633 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TRLINYGSTALQGMDT	L	0.9560	0.7862 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DESSQSTDPISSGCTK	L	0.9560	0.4676 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KTMARCGPLSDSIFDD	L	0.7964	0.4477 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RAPYIGSRTEDKIGYP	L	0.9560	1.2997 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KTIVQAKLTPQQYCEL	L	0.7869	0.9441 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GQHSFMANRMSNTSTR	L	0.9560	0.6033 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HQASWHHNSASIGENA	L	0.9560	0.7404 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VQMLINTYKRDLHACF	L	0.9560	0.4163 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TCISCAQITLVELKTK	L	0.6698	1.7780 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SIFIKDRLTAVNQECW	L	0.9560	0.9040 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SKPGLRIWYRDQNLTP	L	0.9772	1.0176 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ITDITNPLWLDSVIQY	L	0.9560	0.4055 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

LCSGIKGRLGRVSRST	L	0.4356	0.6655 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SELVKYANWDNEFLKA	L	0.9560	0.4396 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VLGYNPPVRFQSKRVP	L	0.9303	0.4089 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HFICSLRGKITKYND	L	0.9560	0.6122 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RENITITSQNRIINSL	L	0.3589	0.7391 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LVENCRPSEGIRFKDN	L	0.9560	0.6096 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HRYNDQYQGHSFMANR	L	0.9560	0.5658 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YLYVDCSNIPSISLDP	L	0.9560	0.5964 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NSEINNLNLTETLNT	L	0.9560	0.8187 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KTTHDLHLTPYLRQHI	L	0.9560	1.0592 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TEILDTSPLQSSRYSS	L	0.9560	0.7650 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ITEINARTRLINYGST	L	0.9560	1.0816 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PSKSTRTNHYASLNY	L	0.9574	0.9957 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RLLWVTQGTADREKLL	L	0.9560	0.5216 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SRTISLTTEGTMLMKL	L	0.9823	0.7295 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LGYLEGTRTLLASRTI	L	0.4658	0.4238 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TELNYVSCALDRKVQ	L	0.9560	0.8404 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TDLEKYNLAFRYEFTR	L	0.7356	0.4266 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NTKLLTTPTRTEILDT	L	0.9560	0.4905 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ANKVKNTPFSHLINCS	L	0.9560	0.6243 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EREQKEALLHQASWHH	L	0.9560	0.5875 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ASKIILNSEINNLNT	L	0.9560	0.6683 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NLVIKAVEKGKNWSQL	L	0.9560	1.2110 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
WKFIGTDLELFGIADF	L	0.9560	0.8314 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PSVNRLAWTIGNRAPY	L	0.6156	0.7211 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

LKEKELNIGRTFGKLP	L	0.9582	1.0012 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LGFPSLESSFCHRYTI	L	0.9560	0.9815 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SQLVEILPNMH SVCIV	L	0.6955	0.8902 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EAELNAARVAVELAIT	L	0.4394	0.7186 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PPDCANAYHYHLGGIE	L	0.9560	0.7941 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LHSLMLDYENNSPLLD	L	0.9560	0.6455 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GRVSRSTLSLSLNVSD	L	0.8296	0.7438 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EVKWINLSEDLREQFN	L	0.9560	1.0834 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ESLSLSRIKSIKNLSD	L	0.5791	0.4411 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ISCFKKPLTFSEKLI	L	0.9560	0.4425 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GFKLIKHLEPLCVSCI	L	0.9560	1.1248 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GVAVLDIALSLAKLSS	L	0.2652	0.9786 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
IYFGKKQYLNQVQLPQ	L	0.9560	0.6350 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LTPQQYCELFSLQKHW	L	0.9560	0.8426 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GKRRIQLQIDFSDQV	L	0.9560	0.5495 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EKLIALITPQVLGGLS	L	0.4212	0.5400 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DELHDLNLKLQISDNK	L	0.9560	1.2314 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LELGTKPTAPHVRNKK	NP	0.9560	1.6432 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
EVTVQARPMNRPTALP	NP	0.9560	1.1868 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
REAYELSPDFTNDEDN	NP	0.9560	0.7736 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
MIPGTTSREFQGIPEP	NP	0.9560	0.6037 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RPTALPPPVDKIEHE	NP	0.9560	0.8078 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ARHGEYAPFARVLNLS	NP	0.7307	1.1912 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VNLVTGHDAYDSHISN	NP	0.9560	0.4523 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PNHWLTTGHMKVIFGI	NP	0.4514	0.5661 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

DDKIEHESTEDSSSS	NP	0.9560	0.4783 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QEKRDPIQHAAANPQ	NP	0.9560	0.5637 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TEDSSSSSFVDLNDP	NP	0.9560	0.4848 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DWPDMSFDERRHVAMN	NP	0.9560	1.2572 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LPPVQEDDESEYTTDS	NP	0.9560	0.4498 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NSGIDLGDLEGGLLT	NP	0.7440	0.8065 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
THSQTLAVLSQKREKL	NP	0.9560	1.0207 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LQRRHEHQEIQAIAED	NP	0.9713	0.6325 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AHDAEVKLQRRHEHQE	NP	0.9560	0.9068 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NEQGVDLPPPPLYAQE	NP	0.9560	0.7914 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
DATRFLDVSPNEPHYS	NP	0.9560	0.7064 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HPAANPQDPFGSIGDV	NP	0.9560	0.5549 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PNEPHYSPLILALKTL	NP	0.9560	1.0253 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SSFILKFVLIHQGVNL	NP	0.9560	0.5680 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QLSAIALGVATAHGST	NP	0.6835	0.8072 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HGSTLAGVNVGEQYQQ	NP	0.9560	0.6834 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
APFARVLNLSGINNLE	NP	0.9560	0.6670 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
MQYLNPPPYADHGANQ	VP40	0.9560	0.6465 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
TVKKQAYRQHKNPNNG	VP40	0.9560	0.5081 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
QQGITPNYVGDLNLDD	VP40	0.9560	0.9987 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PAVSIHPNLPPIVLPT	VP40	0.9560	0.7863 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
FSVKEGMMKKRGENSP	VP40	0.9560	1.0854 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VGDLNLDDQFKGNVCH	VP40	0.9560	0.5763 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NFEYPLAHTVAALLTG	VP40	0.3840	0.5328 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
VKGVPAWLPLGIMSNF	VP40	0.5943	0.8720 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

KGNVCHAFTLEAIIDI	VP40	0.9560	0.4174 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AALTRLSRTFDAFLGV	VP35	0.8740	0.5738 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ELSEETFSPNLSAKD	VP35	0.9143	0.6448 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PFHILAQVLSKIAYKS	VP35	0.3931	0.7557 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SYMQQVSEGLMTGKVP	VP35	0.7727	0.4743 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
LSEVTTRVHEIERQLH	VP35	0.8999	0.4257 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AFLGVVPPVIRVKNFQ	VP35	0.9560	1.0892 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NRQISDIQSTLSEVTT	VP35	0.9560	0.6822 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KRTLADLLIPINRQIS	VP35	0.9560	0.4187 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
GMTLLHHLKSNFVVPE	VP24	0.9560	0.4240 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PSVGGWTVKWGNFVFH	VP24	0.9560	1.3286 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SAIHISPNLLGIYLTS	VP24	0.9560	1.1179 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PFLALRILLGVALKDQ	VP24	0.6817	1.2081 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RYNLPANVTENSINLD	VP24	0.9560	0.4741 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PPPPKDMCRNMKIGLP	VP30	0.9560	0.8032 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RNMKIGLPCADPTCNR	VP30	0.9560	1.3570 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RARMSSTRSSAESSP	VP30	0.9560	0.8008 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
SKPHYTNYHPRARSMS	VP30	0.9560	1.2354 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RNHQVTPTIYHETQLP	VP30	0.9560	0.6913 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
NGVIKQTYTGIHLDKG	VP30	0.7669	0.7316 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
ESSISVQASYDHFILP	VP30	0.9560	0.6557 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
YVMNNIPCESSISVQA	VP30	0.2019	0.4752 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
AGIRKTNRSLINTMTE	VP30	0.9560	0.4873 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
HRSEIGKLDDETSLRAA	VP30	0.9065	0.5694 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
PTIYHETQLPSKPHYT	VP30	0.8398	0.5784 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

TNRELLLLMARKMLPN	VP30	0.8113	0.5038 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
RDHDLNLTNRELLL	VP30	0.4512	0.9756 (Probable Antigen)	Probable Non-Allergen	Non-Toxin
KQEQTkdVLTLENLGH	VP30	0.9560	0.5237 (Probable Antigen)	Probable Non-Allergen	Non-Toxin

Table S4: Worldwide population coverage analysis based on MHC restriction data.

Population/Area	MHC I			MHC II			MHC I and MHC II Combined		
	Coverage(%) ^a	Average hit ^b	PC90 ^c	Coverage(%) ^a	Average hit ^b	PC90 ^c	Coverage(%) ^a	Average hit ^b	PC90 ^c
Central Africa	81.71%	2.32	0.55	51.30%	0.59	0.21	91.09%	2.91	1.05
Central America	5.69%	0.1	0.11	37.16%	0.39	0.16	40.73%	0.49	0.17
East Africa	87.39%	2.78	0.79	44.35%	0.49	0.18	92.98%	3.27	1.18
East Asia	92.99%	3.22	1.19	46.83%	0.53	0.19	96.27%	3.75	1.56
Europe	98.39%	4.56	1.96	52.11%	0.6	0.21	99.23%	5.15	2.43
North Africa	89.71%	2.96	0.97	51.94%	0.61	0.21	95.05%	3.57	1.35
North America	95.70%	3.68	1.41	57.91%	0.68	0.24	98.19%	4.35	2.02
Northeast Asia	93.11%	2.7	1.16	32.27%	0.35	0.15	95.33%	3.05	1.34
Oceania	83.92%	2.27	0.62	34.86%	0.38	0.15	89.52%	2.65	0.95
South Africa	92.33%	3.26	1.13	29.10%	0.3	0.14	94.56%	3.56	1.3
South America	76.48%	1.82	0.43	41.41%	0.46	0.17	86.22%	2.28	0.73
South Asia	89.47%	2.76	0.95	46.65%	0.56	0.19	94.38%	3.32	1.27
Southeast Asia	90.95%	2.59	1.05	30.48%	0.34	0.14	93.71%	2.93	1.22
Southwest Asia	89.37%	2.85	0.94	26.59%	0.29	0.14	92.20%	3.14	1.12
West Africa	88.19%	3.02	0.85	65.24%	0.79	0.29	95.89%	3.82	1.48
West Indies	92.42%	3.35	1.14	41.41%	0.46	0.17	95.56%	3.81	1.43
World	95.75%	3.68	1.4	51.08%	0.58	0.2	97.92%	4.26	1.89

Notes: ^aProjected population coverage.

^bAverage number of epitope hits/HLA combinations recognized by the population.

^cMinimum number of epitope hits/HLA combinations recognized by 90% of the population

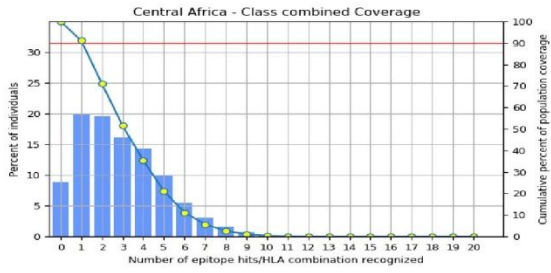
Table S5: Refined vaccine models generated by GalaxyRefine server.

Model	GDT-HA	RMSD	MolProbity	Clash score	Poor rotamers	Rama favored
Initial	1	0	4.857	299.3	84.5	92.6
MODEL 1	0.9156	0.51	2.213	22.2	1.2	95.4
MODEL 2	0.9091	0.519	2.117	22.1	0.7	95.9
MODEL 3	0.9142	0.504	2.125	21.7	0.9	95.7
MODEL 4	0.9156	0.509	2.086	21.2	0.7	96.1
MODEL 5	0.9128	0.509	2.13	21.2	0.9	95.6

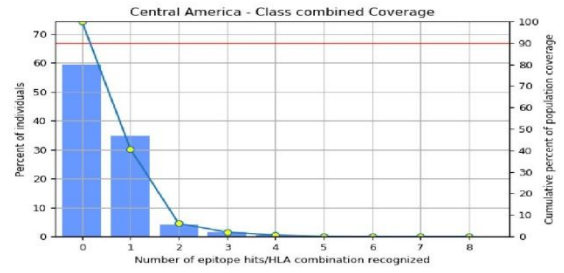
Table S6: List of amino acid residues in disulfide engineering.

Residue 1			Residue 2			Bond		
Chain	Seq #	AA	Chain	Seq #	AA	χ^3	Energy	\sum B-Factor
A	89	GLY	A	92	GLU	125.38	4.97	0
A	120	LEU	A	125	ALA	111.98	5.66	0
A	145	ALA	A	168	MET	-113.61	4.78	0
A	146	ALA	A	166	VAL	114.04	3.81	0
A	157	ALA	A	166	VAL	106.69	4.79	0
A	160	PHE	A	164	ARG	123.39	3.38	0
A	160	PHE	A	188	LEU	98.64	4.78	0
A	165	HIS	A	185	THR	75.13	7.06	0
A	166	VAL	A	188	LEU	-108.19	5.84	0
A	169	ALA	A	210	THR	-82.05	2.34	0
A	170	ALA	A	181	ALA	82.51	6.92	0
A	171	TYR	A	213	GLY	-105.63	2.53	0
A	182	ALA	A	214	ILE	110.99	2.28	0
A	208	SER	A	252	PHE	-74.24	5.47	0
A	212	ALA	A	253	ASN	-101.5	4.55	0
A	242	PRO	A	249	PRO	110.15	3.04	0
A	257	SER	A	276	ILE	-90.4	7.12	0
A	269	LEU	A	272	ARG	81.84	1.08	0
A	274	HIS	A	297	PHE	-98.88	7.18	0
A	275	PHE	A	295	LEU	85.2	6.61	0
A	279	LEU	A	291	ILE	-111.86	8.65	0
A	283	GLY	A	365	GLY	-86.62	1.49	0
A	299	SER	A	302	PRO	111.15	2.61	0
A	317	PRO	A	327	VAL	-72.59	3.24	0
A	320	LEU	A	349	PRO	-80.82	5.13	0
A	320	LEU	A	359	ALA	99.33	3.91	0
A	321	GLY	A	339	ILE	-80.07	4.92	0
A	330	ASP	A	333	LYS	89.66	1.57	0
A	334	PRO	A	354	GLY	82.49	2.6	0
A	343	GLY	A	362	PRO	121.54	5.39	0
A	393	LYS	A	427	LYS	-105.83	4.17	0
A	400	LYS	A	403	ALA	-88.77	2.45	0
A	419	ASP	A	422	HIS	103.26	0.76	0
A	424	LEU	A	443	PRO	124.11	3.82	0
A	428	LEU	A	439	LEU	120.43	2.19	0
A	431	SER	A	435	LYS	92.98	3.01	0
A	440	GLY	A	471	LYS	105.22	6.27	0
A	442	LYS	A	473	PHE	70.47	8.24	0
A	468	ALA	A	492	PHE	-95.84	0.75	0

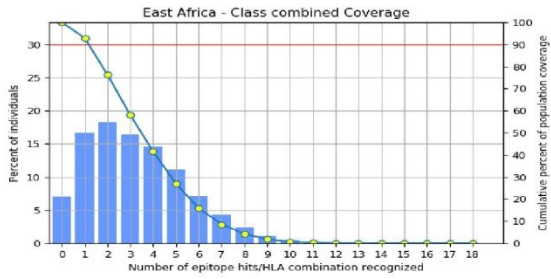
A	471	LYS	A	497	PRO	-80.16	3.23	0
A	499	VAL	A	518	TRP	91.87	5.53	0
A	502	VAL	A	516	VAL	121.24	4.85	0
A	515	THR	A	524	HIS	97.82	4.87	0
A	517	LYS	A	522	VAL	98.18	4.95	0
A	525	LYS	A	528	LYS	125.78	4.26	0



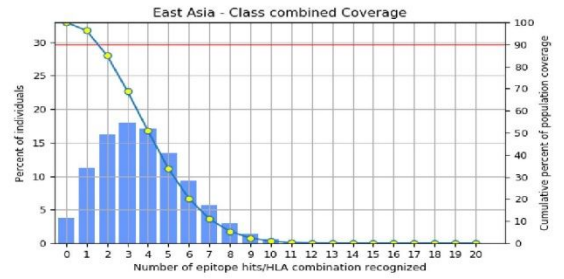
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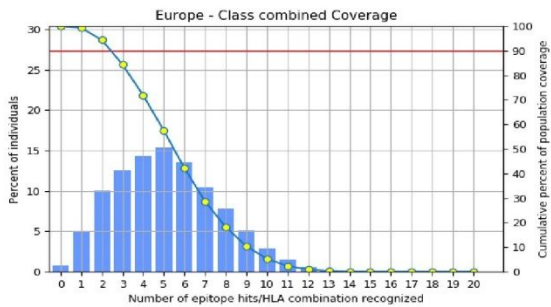
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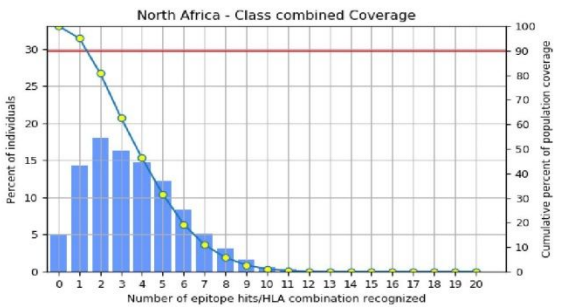
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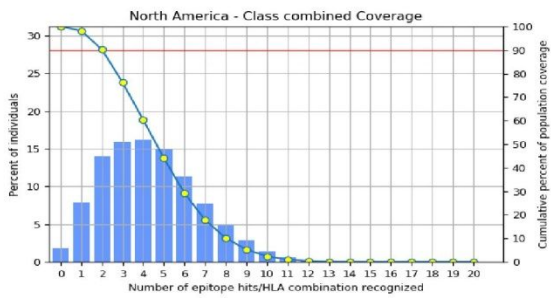
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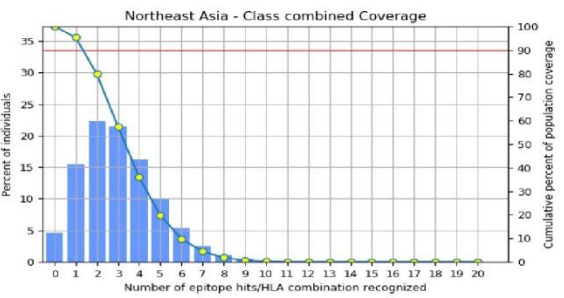
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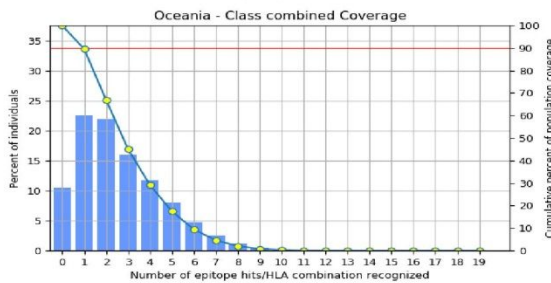
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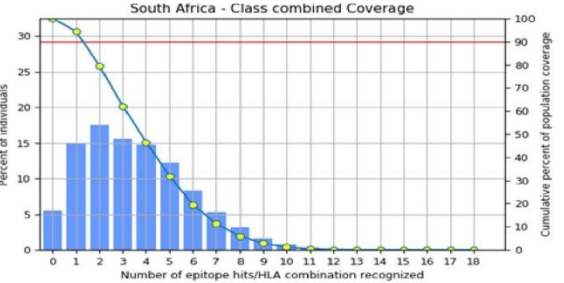
(G)



(H)



(I)



(J)

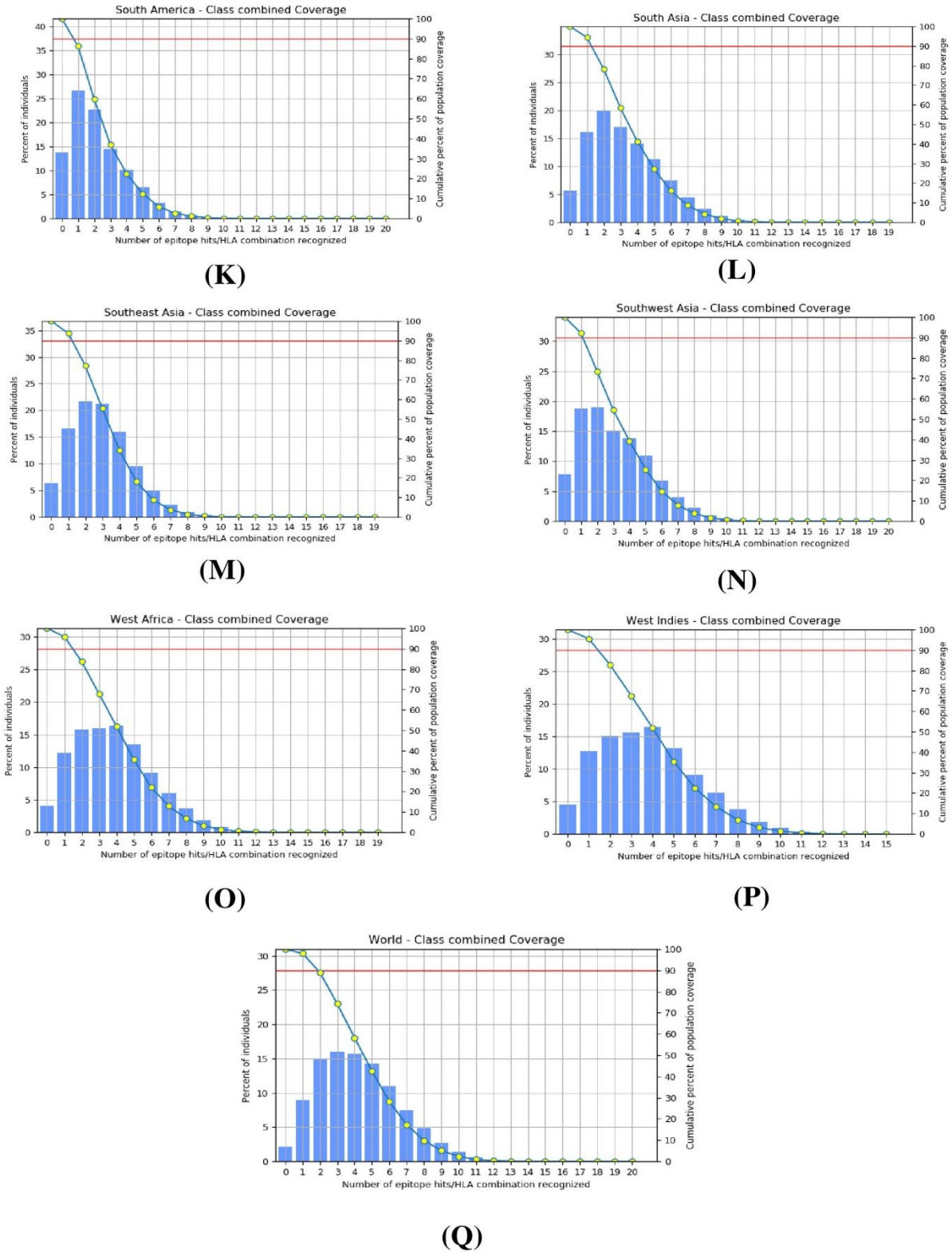
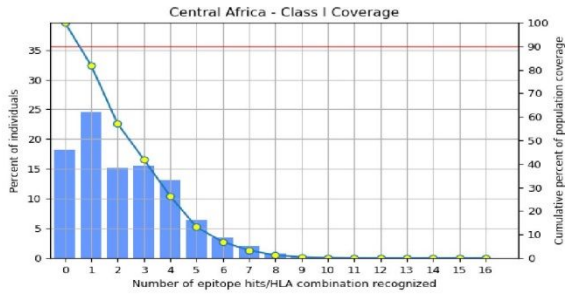
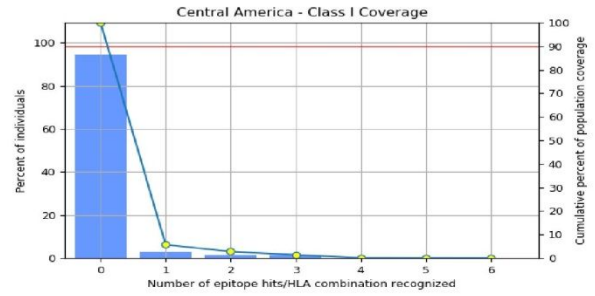


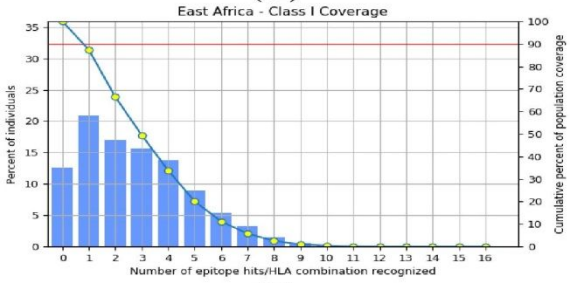
Figure S1: Population/HLA coverage analysis of the shortlisted epitopes based on combined MHCI and MHCII restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.



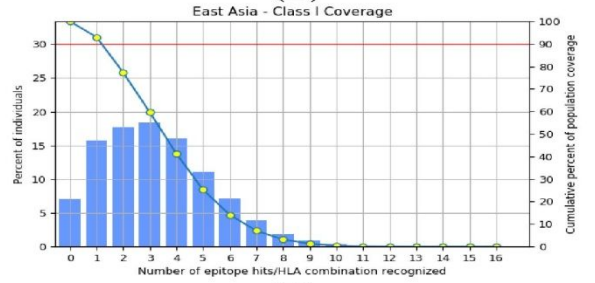
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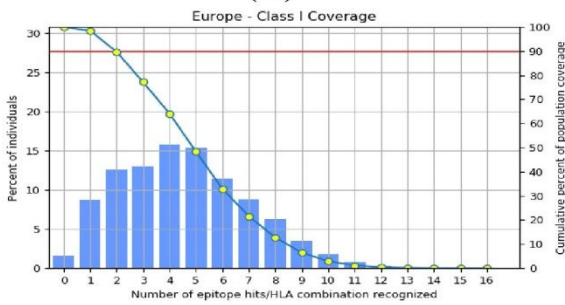
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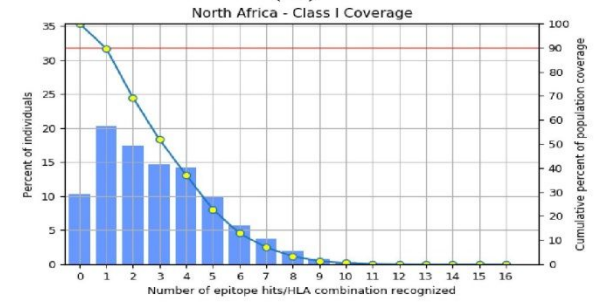
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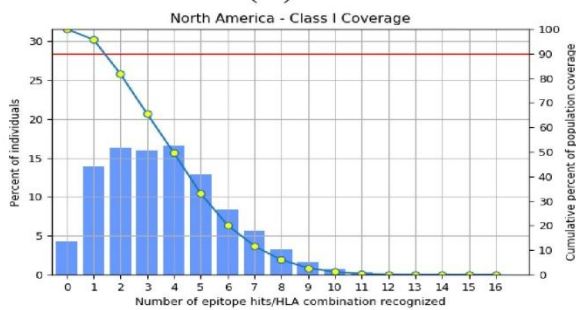
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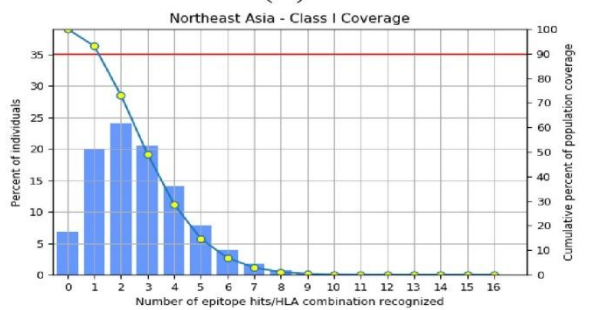
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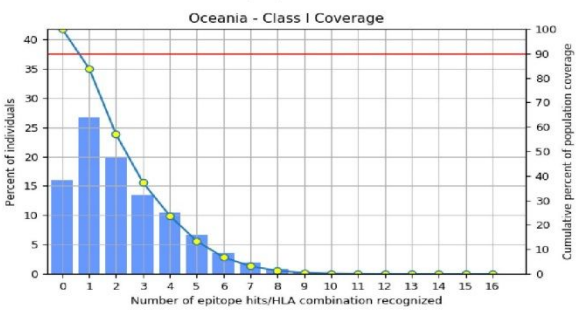
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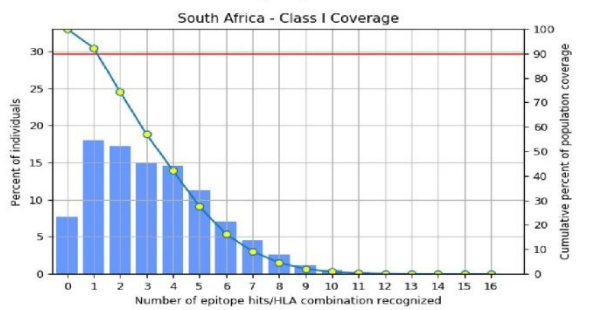
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(H)



(I)



(J)

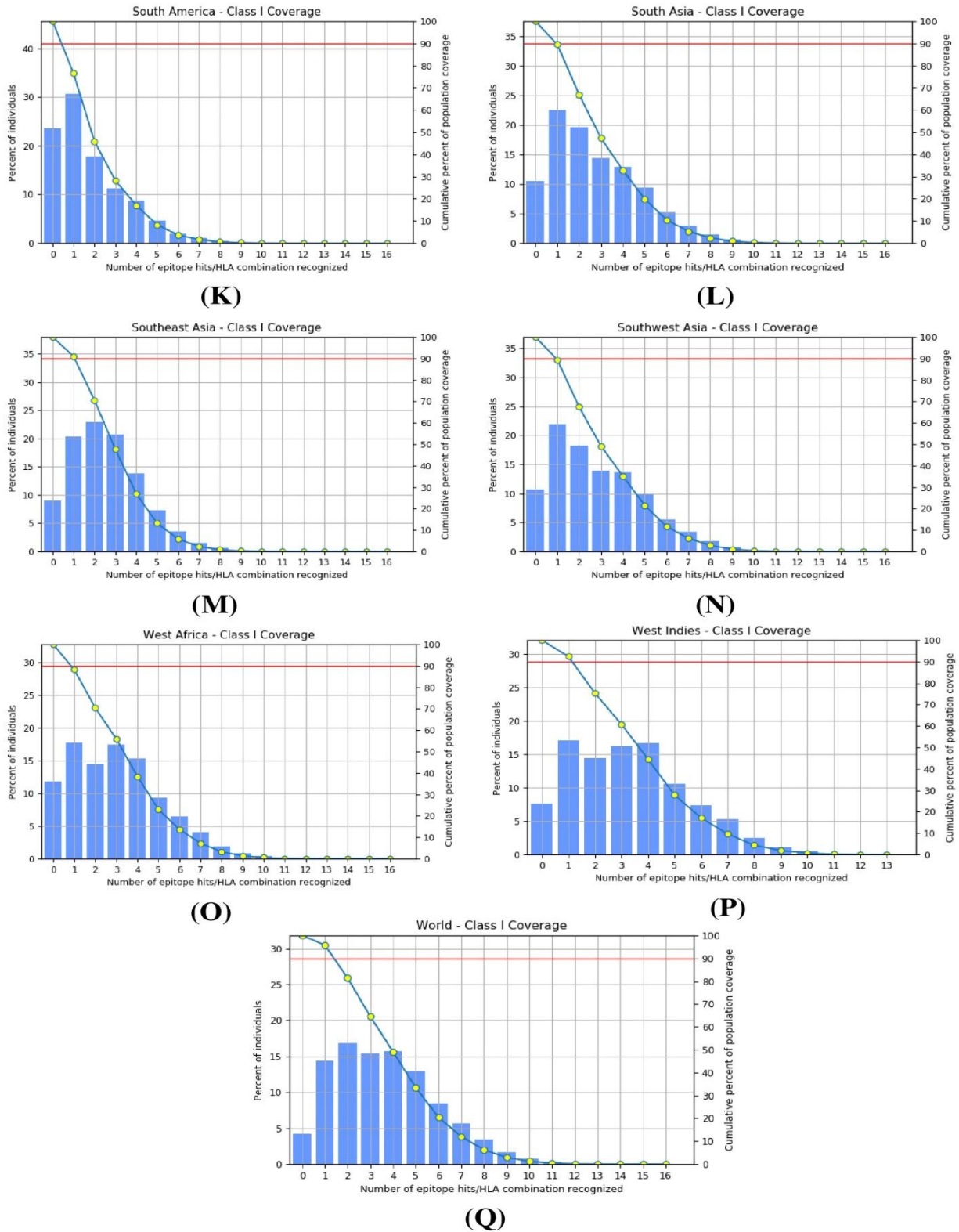
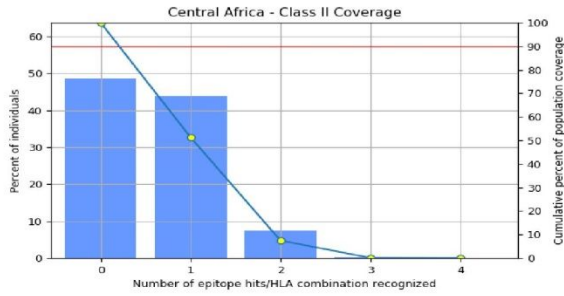
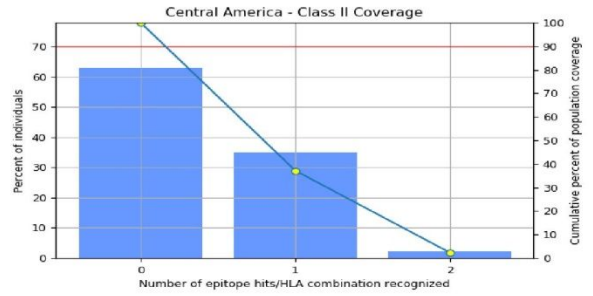


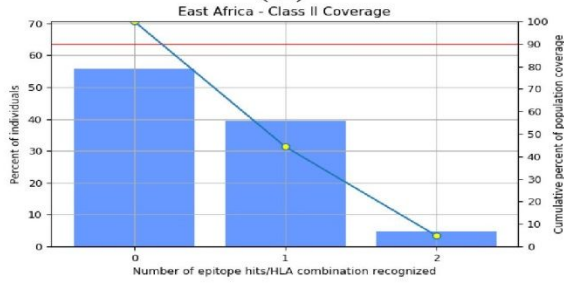
Figure S2: Population coverage analysis of the shortlisted epitopes based on MHC I restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.



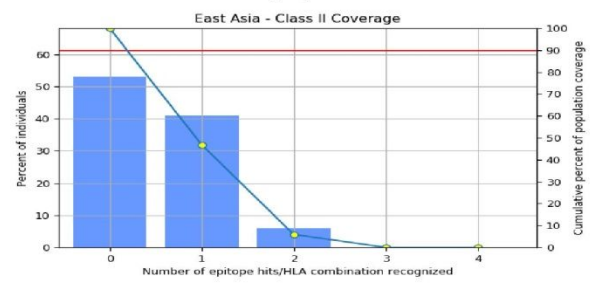
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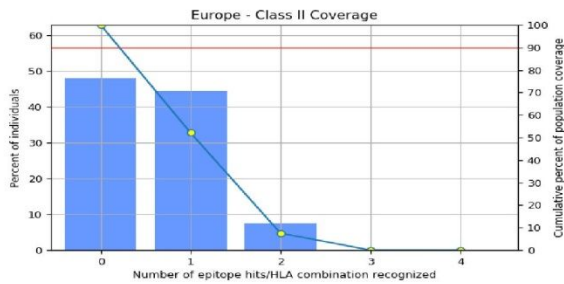
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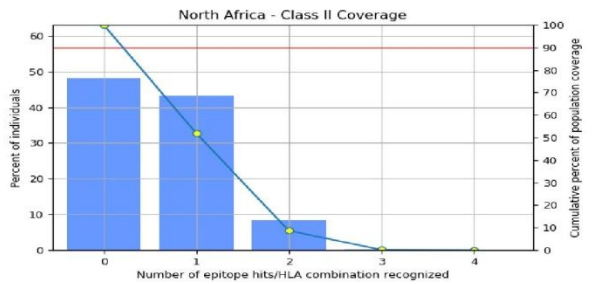
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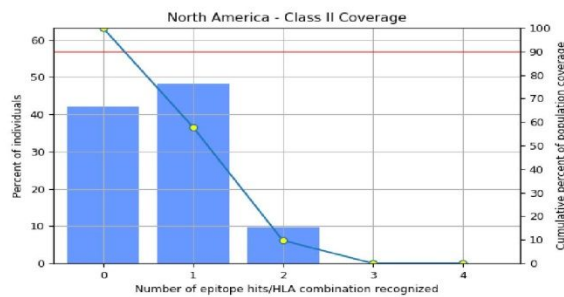
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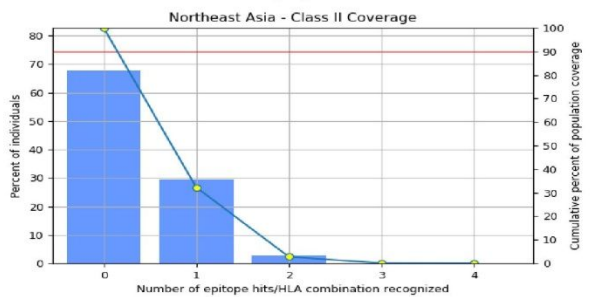
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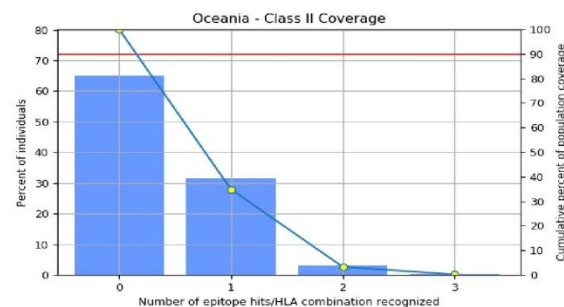
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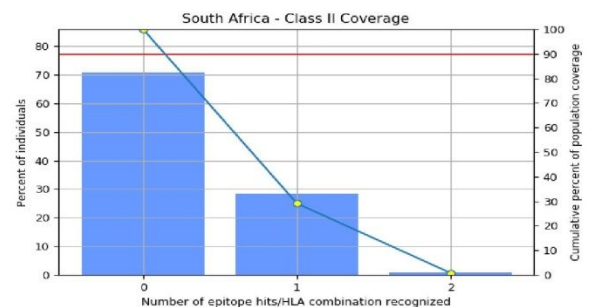
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(H)



(I)



(J)

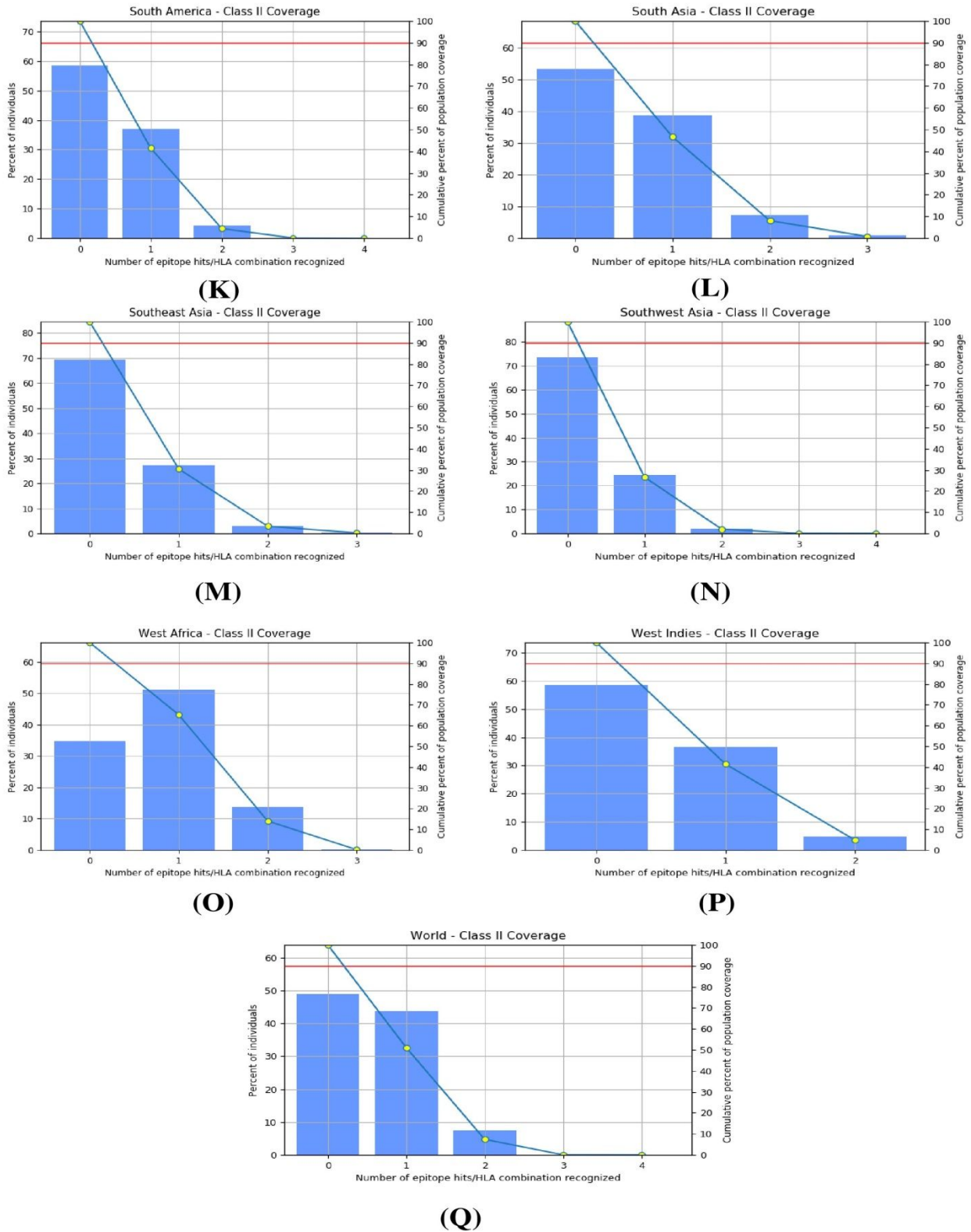
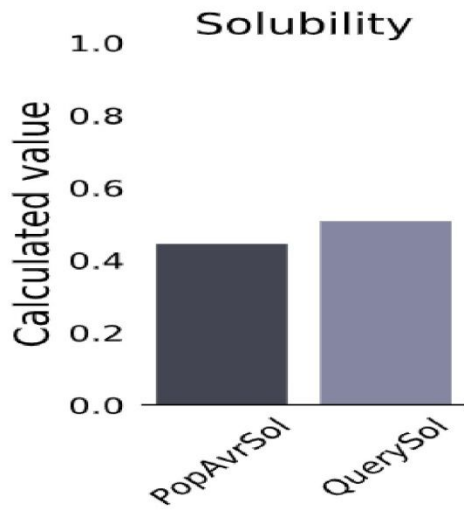


Figure S3: Population coverage analysis of the shortlisted epitopes based on MHCII restriction data for (A) Central Africa, (B) Central America, (C) East Africa, (D) East Asia, (E) Europe, (F) North Africa, (G) North America, (H) Northeast Asia, (I) Oceania, (J) South Africa, (K) South America, (L) South Asia, (M) Southeast Asia, (N) Southwest Asia, (O) West Africa, (P) West Indies, and (Q) World- using the IEDB analysis resource.



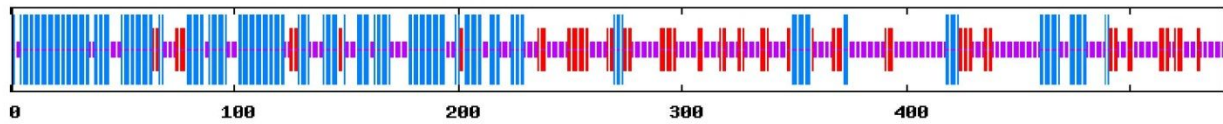
(A)

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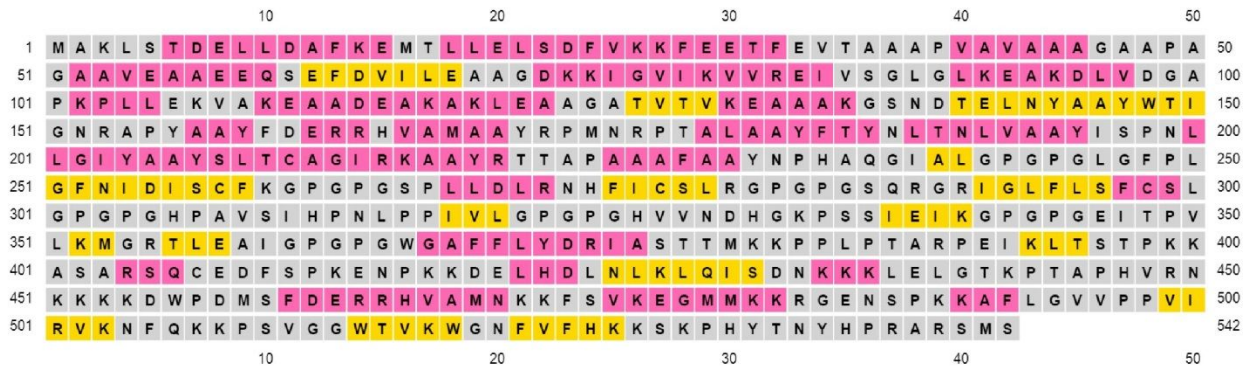
SOPMA :

Alpha helix (Hh)	: 199 is 36.72%
3 ₁₀ helix (Gg)	: 0 is 0.00%
Pi helix (Ii)	: 0 is 0.00%
Beta bridge (Bb)	: 0 is 0.00%
Extended strand (Ee)	: 98 is 18.08%
Beta turn (Tt)	: 0 is 0.00%
Bend region (Ss)	: 0 is 0.00%
Random coil (Cc)	: 245 is 45.20%
Ambiguous states (?)	: 0 is 0.00%
Other states	: 0 is 0.00%

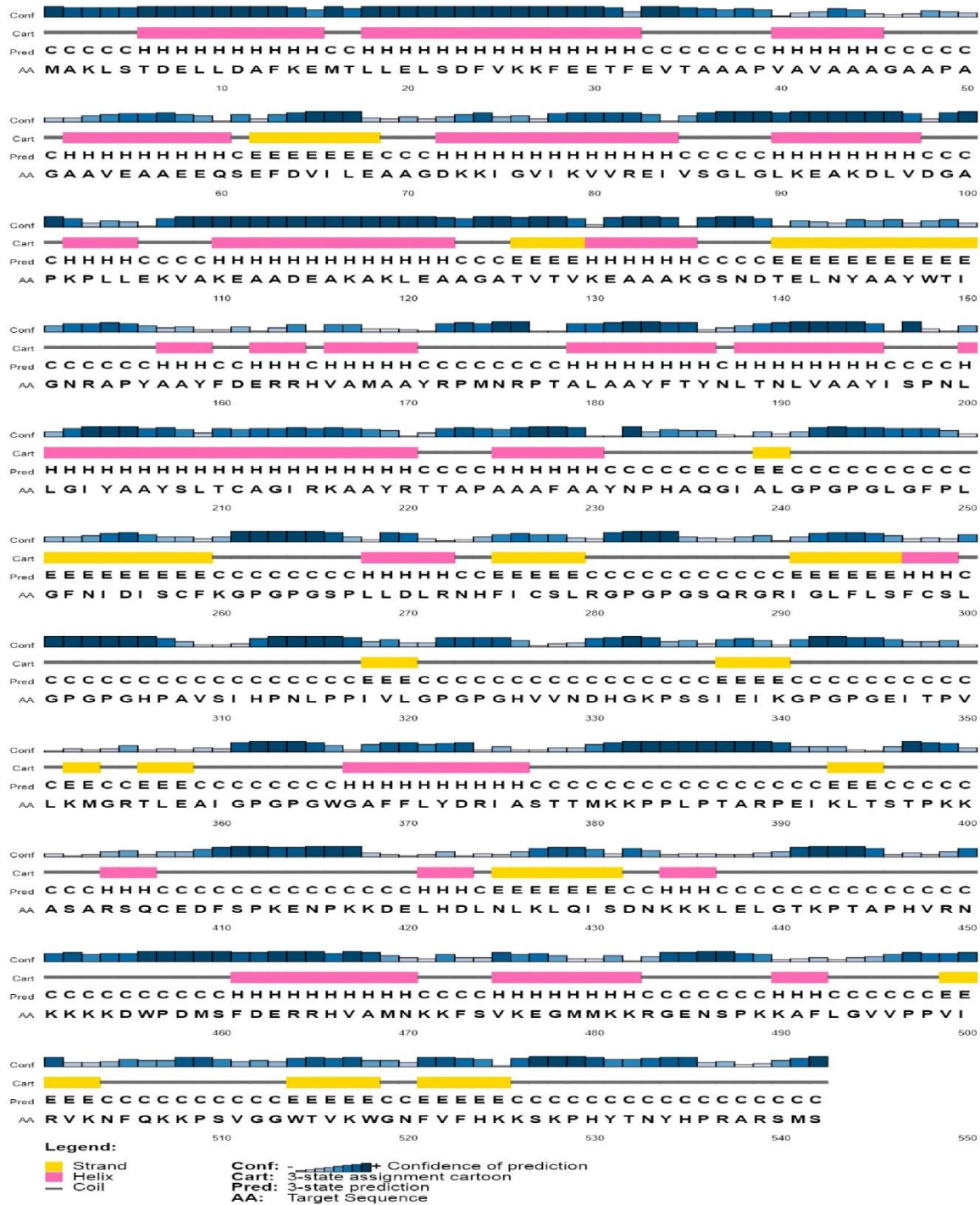
(B)



(C)



(D)



(E)

Figure S4: (A) Solubility prediction of the vaccine protein by Protein-Sol server, (B) Composition of the secondary structure from amino acid residues of vaccine construct; (C) Predicted secondary structure of vaccine construct by SOPMA server, (D) Predicted secondary structure of vaccine construct by PSIPRED server, and (E) Predicted cart of the vaccine construct .by PSIPRED server.

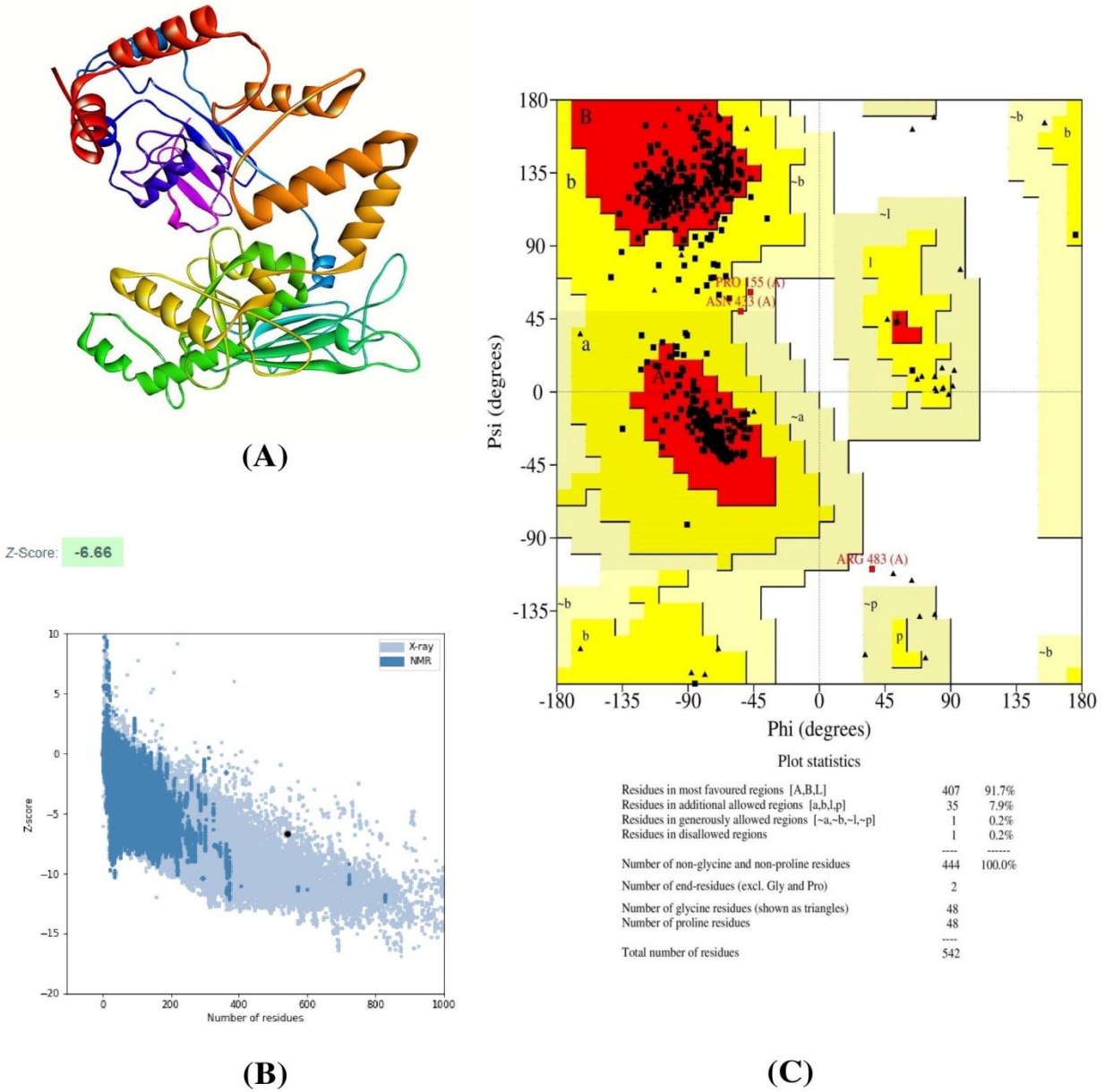


Figure S5: (A) 3D structure of the pre-refined vaccine construct, (B) Z-score of the pre-refined vaccine construct predicted by PROSA server, and (C) Ramachandran plot analysis of the pre-refined vaccine construct.