





Figure S3. Analysis of humoral responses in CD-1 mice vaccinated with CRM₁₉₇- or KLH-conjugated pepL1. (a) Indirect ELISA with sera from mice vaccinated with pepL1-CRM₁₉₇- or KLH-conjugated with or without AddaVax adjuvant. Wells were coated with 1 µg of non-conjugated pepL1. Red line represents background immunoreactivity. (b) Antigen-specific B cells assessed via ELISpot. Wells were coated with 1 µg of non-conjugated pepL1 and splenocytes seeded at 10⁶ cells/well. One-way ANOVA with Tukey's multiple comparison test. * $p < 0.05$, ** $p < 0.01$, **** $p < 0.0001$.

Table S1. Structure-based predicted linear epitopes by Ellipro, using the Homology model of BuiC8 generated by Modeller and the structure of the VceC efflux pump of *Vibrio cholerae* (PDB code 1yc9, seqid 35%) as a template.

No. ♦	Chain ♦	Start ♦	End ♦	Peptide	Number of residues ♦	Score ♦
1	A	139	173	GNLSLMRQHWPDNVYGPGLANADTWNTGTLSL	35	0.888
2	A	233	269	YERQNALAELARKRLRAGIGTQLEVSQAEAPLPDYSR	37	0.793
3	A	341	406	IDVAKAAFYPNVDLIASLGGFAVSAPFATFLRAMNGGWSAGPALTLPFEGGRLRAQLGVASAGYD	66	0.741
4	A	449	474	RSYDLSHAGFSRGLTDYVNVLIAQSQ	26	0.683
5	A	306	321	LDANAALPSALPAELL	16	0.627
6	A	291	299	KGPGAGASL	9	0.587

Table S2. MHCII binding affinity predictions of pepL1 (a) and pepL2 (b) using the IEDB Tool and the NN-align method. IC50 values (nM) below 100 nM are shown in orange and below 50 nM in red.

a) pepL1 sequence QHWPDNVYYPGPGPLANADT								
#	Peptide	Allele	Length	NN align core	NN align IC50(nM)	NN align percentile rank	NN align adjusted rank	N. of binding alleles
1	DNVYYPGPGPLAN	HLA-DQA1*05:01/DQB1*03:01	12	VYYGPGPLA	200.5	3	8.9	3
		HLA-DRB1*01:01	12	VYYGPGPLA	344.1	31	91.92	
		HLA-DRB1*09:01	12	VYYGPGPLA	482.7	16	47.44	
2	DNVYYPGPGPLANA	HLA-DQA1*05:01/DQB1*03:01	13	VYYGPGPLA	119.6	2.8	4.37	3
		HLA-DRB1*01:01	13	VYYGPGPLA	150.7	31	48.34	
		HLA-DRB1*09:01	13	VYYGPGPLA	396.9	20	31.19	
3	DNVYYPGPGPLANAD	HLA-DQA1*05:01/DQB1*03:01	14	VYYGPGPLA	92.5	3.5	3.77	3
		HLA-DRB1*01:01	14	VYYGPGPLA	148.4	36	38.76	
		HLA-DRB1*09:01	14	VYYGPGPLA	417.7	27	29.07	
4	DNVYYPGPGPLANAD T	HLA-DQA1*05:01/DQB1*03:01	15	VYYGPGPLA	71.5	4.4	4.4	3
		HLA-DRB1*01:01	15	VYYGPGPLA	213.2	39	39	
		HLA-DRB1*09:01	15	VYYGPGPLA	464.7	33	33	
5	HWPDNVYYPGPGPLA	HLA-DQA1*05:01/DQB1*03:01	14	VYYGPGPLA	311.8	12	12.92	2
		HLA-DRB1*09:01	14	NVYYPGPGPL	425.9	27	29.07	
6	HWPDNVYYPGPGPLA N	HLA-DQA1*05:01/DQB1*03:01	15	VYYGPGPLA	104.8	6.6	6.6	2
		HLA-DRB1*09:01	15	NVYYPGPGPL	383.7	30	30	
7	HWPDNVYYPGPGPLA NA	HLA-DQA1*05:01/DQB1*03:01	16	VYYGPGPLA	58.1	5.3	6.12	2
		HLA-DRB1*09:01	16	NVYYPGPGPL	354.9	31	35.78	
8	HWPDNVYYPGPGPLA NAD	HLA-DQA1*05:01/DQB1*03:01	17	VYYGPGPLA	45.2	5.4	9.2	2
		HLA-DRB1*09:01	17	NVYYPGPGPL	380.7	36	61.32	
9	HWPDNVYYPGPGPLA NADT	HLA-DRB1*09:01	18	NVYYPGPGPL	386.2	41	121.35	1
10	NVYYPGPGPLANA	HLA-DQA1*05:01/DQB1*03:01	12	VYYGPGPLA	147.6	1.9	5.63	2
		HLA-DRB1*01:01	12	VYYGPGPLA	192.4	22	65.24	
11	NVYYPGPGPLANAD	HLA-DQA1*05:01/DQB1*03:01	13	VYYGPGPLA	123.4	3	4.68	2
		HLA-DRB1*01:01	13	VYYGPGPLA	153.5	31	48.34	
12	NVYYPGPGPLANADT	HLA-DQA1*05:01/DQB1*03:01	14	VYYGPGPLA	102.2	4	4.31	2
		HLA-DRB1*01:01	14	VYYGPGPLA	156.5	37	39.84	
13	PDNVYYPGPGPLA	HLA-DQA1*05:01/DQB1*03:01	12	VYYGPGPLA	438.7	15	44.48	2
		HLA-DQA1*05:01/DQB1*03:01	12	VYYGPGPLA	482.7	7.2	21.35	

14	PDNVYYGPGPLAN	HLA-DQA1*05:01/DQB1*03:01	13	VYYGPGPLA	176.1	4.5	7.02	3
		HLA-DRB1*01:01	13	VYYGPGPLA	301.2	43	67.05	
		HLA-DRB1*09:01	13	VYYGPGPLA	348.5	18	28.07	
15	PDNVYYGPGPLAN A	HLA-DQA1*05:01/DQB1*03:01	14	VYYGPGPLA	98.7	3.8	4.09	3
		HLA-DRB1*01:01	14	VYYGPGPLA	164.5	38	40.92	
		HLA-DRB1*09:01	14	VYYGPGPLA	302.9	22	23.69	
16	PDNVYYGPGPLAN A D	HLA-DQA1*05:01/DQB1*03:01	15	VYYGPGPLA	70.3	4.3	4.3	3
		HLA-DRB1*01:01	15	VYYGPGPLA	227	40	40	
		HLA-DRB1*09:01	15	VYYGPGPLA	341.1	27	27	
17	PDNVYYGPGPLAN A DT	HLA-DQA1*05:01/DQB1*03:01	16	VYYGPGPLA	55.5	5	5.77	3
		HLA-DRB1*01:01	16	VYYGPGPLA	382	40	46.17	
		HLA-DRB1*09:01	16	NVYYGPGPL	382.8	33	38.09	
18	QHWPDNVYYGPGPL A	HLA-DQA1*05:01/DQB1*03:01	15	VYYGPGPLA	244.6	14	14	2
		HLA-DRB1*09:01	15	NVYYGPGPL	468.8	33	33	
19	QHWPDNVYYGPGPL AN	HLA-DQA1*05:01/DQB1*03:01	16	VYYGPGPLA	83.9	7.9	9.12	2
		HLA-DRB1*09:01	16	NVYYGPGPL	424.2	35	40.4	
20	QHWPDNVYYGPGPL ANA	HLA-DQA1*05:01/DQB1*03:01	17	VYYGPGPLA	50.5	6.2	10.56	2
		HLA-DRB1*09:01	17	NVYYGPGPL	374.2	36	61.32	
21	QHWPDNVYYGPGPL ANAD	HLA-DQA1*05:01/DQB1*03:01	18	VYYGPGPLA	42	6.1	18.05	2
		HLA-DRB1*09:01	18	NVYYGPGPL	380.1	40	118.39	
22	VYYGPGPLANAD	HLA-DQA1*05:01/DQB1*03:01	12	VYYGPGPLA	221	3.3	9.79	2
		HLA-DRB1*01:01	12	VYYGPGPLA	386.6	33	97.86	
23	VYYGPGPLANADT	HLA-DQA1*05:01/DQB1*03:01	13	VYYGPGPLA	196.5	5	7.8	2
		HLA-DRB1*01:01	13	VYYGPGPLA	313.7	44	68.61	
24	WPDNVYYGPGPLA	HLA-DQA1*05:01/DQB1*03:01	13	VYYGPGPLA	379.5	9.1	14.19	2
		HLA-DRB1*09:01	13	NVYYGPGPL	419.6	21	32.75	
25	WPDNVYYGPGPLAN	HLA-DQA1*05:01/DQB1*03:01	14	VYYGPGPLA	137	5.6	6.03	3
		HLA-DRB1*09:01	14	VYYGPGPLA	353.2	24	25.84	
		HLA-DRB1*01:01	14	VYYGPGPLA	379.8	54	58.15	
26	WPDNVYYGPGPLAN A	HLA-DQA1*05:01/DQB1*03:01	15	VYYGPGPLA	74.4	4.6	4.6	3
		HLA-DRB1*01:01	15	VYYGPGPLA	288.3	44	44	
		HLA-DRB1*09:01	15	VYYGPGPLA	325.6	27	27	
27	WPDNVYYGPGPLAN AD	HLA-DQA1*05:01/DQB1*03:01	16	VYYGPGPLA	53.3	4.9	5.66	3

		HLA-DRB1*09:01	16	VYYGPGPLA	367	31	35.78	
		HLA-DRB1*01:01	16	VYYGPGPLA	455.4	43	49.63	
28	WPDNVYYGPGPLAN ADT	HLA- DQA1*05:01/DQB1*03: 01	17	VYYGPGPLA	45.5	5.4	9.2	2
		HLA-DRB1*09:01	17	NVYYGPGPL	393.1	37	63.02	
b) pepL2 sequence GGFGVTAPFTDFLRAMNGG								
	Peptide	Allele	Length	NN align core	NN align IC50(nM)	NN align percentile rank	NN align adjusted rank	N.of binding alleles
1	APFTDFLRAMNG	HLA-DRB1*11:01	12	FTDFLRAMN	151.2	5.8	17.2	2
		HLA-DRB1*01:01	12	TDFLRAMNG	245.9	26	77.1	
2	APFTDFLRAMNGG	HLA-DRB1*11:01	13	FTDFLRAMN	90.8	6.4	9.98	2
		HLA-DRB1*01:01	13	TDFLRAMNG	105	25	38.98	
3	FGVTAPFTDFLRA	HLA- DPA1*01:03/DPB1*02:01	13	APFTDFLRA	392.6	9.6	14.97	1
4	FGVTAPFTDFLRA M	HLA- DPA1*01:03/DPB1*02:01	14	APFTDFLRA	257.2	8.9	9.58	1
5	FGVTAPFTDFLRA MN	HLA- DPA1*01:03/DPB1*02:01	15	APFTDFLRA	254.4	11	11	2
		HLA- DPA1*03:01/DPB1*04:02	15	TAPFTDFLR	400.6	17	17	
6	FGVTAPFTDFLRA MNG	HLA- DPA1*01:03/DPB1*02:01	16	APFTDFLRA	285.3	14	16.16	
		HLA-DRB1*11:01	16	FTDFLRAMN	313.4	18	20.78	
		HLA- DPA1*02:01/DPB1*05:01	16	TAPFTDFLR	323.4	12	13.85	5
		HLA- DPA1*03:01/DPB1*04:02	16	TAPFTDFLR	379.9	23	26.55	
		HLA-DRB1*08:02	16	FTDFLRAMN	434.7	23	26.55	
7	FGVTAPFTDFLRA MNGG	HLA- DPA1*02:01/DPB1*05:01	17	TAPFTDFLR	206.6	14	23.85	
		HLA-DRB1*11:01	17	FTDFLRAMN	272.3	16	27.25	
		HLA-DRB1*08:02	17	FTDFLRAMN	275.6	22	37.47	5
		HLA- DPA1*01:03/DPB1*02:01	17	APFTDFLRA	311.5	16	27.25	
		HLA- DPA1*03:01/DPB1*04:02	17	TAPFTDFLR	385.3	29	49.39	
8	GFGVTAPFTDFL	HLA-DRB1*07:01	12	FGVTAPFTD	443.5	21	62.27	
		HLA- DQA1*05:01/DQB1*02:01	12	VTAPFTDFL	487.6	4.4	13.05	2
9	GFGVTAPFTDFLR	HLA-DRB1*09:01	13	FGVTAPFTD	483.8	23	35.87	1
10	GFGVTAPFTDFLRA	HLA- DPA1*01:03/DPB1*02:01	14	APFTDFLRA	346.7	12	12.92	1
11	GFGVTAPFTDFLRA M	HLA- DPA1*01:03/DPB1*02:01	15	APFTDFLRA	241.7	11	11	1
12	GFGVTAPFTDFLRA MN	HLA- DPA1*01:03/DPB1*02:01	16	APFTDFLRA	241.5	12	13.85	
		HLA- DPA1*02:01/DPB1*05:01	16	TAPFTDFLR	305.8	11	12.7	3
		HLA- DPA1*03:01/DPB1*04:02	16	TAPFTDFLR	309.1	20	23.09	
13	GFGVTAPFTDFLRA MNG	HLA- DPA1*02:01/DPB1*05:01	17	TAPFTDFLR	181.9	13	22.14	
		HLA- DPA1*01:03/DPB1*02:01	17	APFTDFLRA	260	14	23.85	
		HLA-DRB1*08:02	17	FTDFLRAMN	291.8	23	39.17	6
		HLA- DPA1*03:01/DPB1*04:02	17	TAPFTDFLR	307.7	25	42.58	
		HLA-DRB1*11:01	17	FTDFLRAMN	369.6	19	32.36	

		HLA-DQA1*05:01/DQB1*02:01	17	VTAPFTDFL	483.5	18	30.66	
		HLA-DPA1*02:01/DPB1*05:01	18	TAPFTDFLR	145.3	15	44.4	
		HLA-DRB1*08:02	18	FTDFLRAMN	202.5	22	65.11	
14	GFGVTAPFTDFLRA	HLA-DPA1*01:03/DPB1*02:01	18	APFTDFLRA	273.4	17	50.31	6
	MNGG	HLA-DRB1*11:01	18	FTDFLRAMN	285.1	17	50.31	
		HLA-DPA1*03:01/DPB1*04:02	18	TAPFTDFLR	325.4	31	91.75	
		HLA-DQA1*05:01/DQB1*02:01	18	VTAPFTDFL	496.5	21	62.15	
15	GGFGVTAPFTDF	HLA-DRB1*07:01	12	FGVTAPFTD	482.7	22	65.24	1
16	GGFGVTAPFTDFL	HLA-DQA1*05:01/DQB1*02:01	13	GFGVTAPFT	331.7	4.6	7.17	3
		HLA-DRB1*09:01	13	FGVTAPFTD	333.8	18	28.07	
		HLA-DRB1*07:01	13	FGVTAPFTD	383.2	25	38.98	
17	GGFGVTAPFTDFLR	HLA-DRB1*09:01	14	FGVTAPFTD	334.3	23	24.77	4
		HLA-DQA1*05:01/DQB1*02:01	14	GFGVTAPFT	370	7.5	8.08	
		HLA-DRB1*07:01	14	FGVTAPFTD	486.9	32	34.46	
		HLA-DPA1*01:03/DPB1*02:01	14	GVTAPFTDF	499.4	15	16.15	
18	GGFGVTAPFTDFLR	HLA-DPA1*01:03/DPB1*02:01	15	APFTDFLRA	341.9	14	14	3
	A	HLA-DQA1*05:01/DQB1*02:01	15	GFGVTAPFT	375.7	9.8	9.8	
		HLA-DRB1*09:01	15	FGVTAPFTD	393.8	30	30	
19	GGFGVTAPFTDFLR	HLA-DPA1*01:03/DPB1*02:01	16	APFTDFLRA	243	12	13.85	5
	AM	HLA-DQA1*05:01/DQB1*02:01	16	GFGVTAPFT	360.2	12	13.85	
		HLA-DRB1*09:01	16	FGVTAPFTD	459.8	36	41.55	
		HLA-DQA1*05:01/DQB1*03:01	16	FGVTAPFTD	469.2	29	33.47	
		HLA-DPA1*03:01/DPB1*04:02	16	TAPFTDFLR	489.4	27	31.17	
20	GGFGVTAPFTDFLR	HLA-DPA1*02:01/DPB1*05:01	17	TAPFTDFLR	183.1	13	22.14	7
	AMN	HLA-DPA1*01:03/DPB1*02:01	17	APFTDFLRA	237.7	13	22.14	
		HLA-DPA1*03:01/DPB1*04:02	17	TAPFTDFLR	276.5	23	39.17	
		HLA-DQA1*05:01/DQB1*02:01	17	GFGVTAPFT	369.4	14	23.85	
		HLA-DQA1*05:01/DQB1*03:01	17	FGVTAPFTD	405.3	33	56.21	
		HLA-DRB1*08:02	17	FTDFLRAMN	426.9	32	54.5	
		HLA-DRB1*09:01	17	FGVTAPFTD	447.7	39	66.43	
21	GGFGVTAPFTDFLR	HLA-DPA1*02:01/DPB1*05:01	18	TAPFTDFLR	138.1	15	44.4	8
	AMNG	HLA-DRB1*08:02	18	FTDFLRAMN	243	26	76.95	
		HLA-DPA1*01:03/DPB1*02:01	18	APFTDFLRA	246.9	15	44.4	
		HLA-DPA1*03:01/DPB1*04:02	18	TAPFTDFLR	288	29	85.83	
		HLA-DQA1*05:01/DQB1*02:01	18	GFGVTAPFT	357.6	16	47.35	
		HLA-DQA1*05:01/DQB1*03:01	18	FGVTAPFTD	376.3	36	106.55	
		HLA-DRB1*11:01	18	FTDFLRAMN	388.3	21	62.15	

		HLA-DRB1*09:01	18	FGVTAPFTD	466	45	133.19	
22	GVTAPFTDFLRAM	HLA-DPA1*01:03/DPB1*02:01	13	APFTDFLRA	328.4	8.5	13.25	1
23	GVTAPFTDFLRAM N	HLA-DPA1*01:03/DPB1*02:01	14	APFTDFLRA	307.7	11	11.84	2
		HLA-DRB1*11:01	14	FTDFLRAMN	461	23	24.77	
24	GVTAPFTDFLRAM NG	HLA-DRB1*11:01	15	FTDFLRAMN	212.6	16	16	2
		HLA-DPA1*01:03/DPB1*02:01	15	APFTDFLRA	344	14	14	
		HLA-DRB1*11:01	16	FTDFLRAMN	201.8	14	16.16	
		HLA-DRB1*08:02	16	FTDFLRAMN	312.5	17	19.62	
25	GVTAPFTDFLRAM NGG	HLA-DPA1*01:03/DPB1*02:01	16	APFTDFLRA	387.9	17	19.62	5
		HLA-DPA1*02:01/DPB1*05:01	16	TAPFTDFLR	444.3	15	17.31	
		HLA-DPA1*03:01/DPB1*04:02	16	TAPFTDFLR	499.8	27	31.17	
26	PFTDFLRAMNGG	HLA-DRB1*11:01	12	FTDFLRAMN	127.1	5	14.83	2
		HLA-DRB1*01:01	12	TDFLRAMNG	129.8	17	50.41	
27	TAPFTDFLRAMN	HLA-DRB1*11:01	12	FTDFLRAMN	468.2	13	38.55	1
28	TAPFTDFLRAMNG	HLA-DRB1*11:01	13	FTDFLRAMN	139.2	8.7	13.57	2
		HLA-DRB1*01:01	13	TDFLRAMNG	241.2	39	60.82	
29	TAPFTDFLRAMNG G	HLA-DRB1*11:01	14	FTDFLRAMN	96.6	8.7	9.37	2
		HLA-DRB1*01:01	14	TDFLRAMNG	156.7	37	39.84	
30	VTAPFTDFLRAM	HLA-DPA1*01:03/DPB1*02:01	12	APFTDFLRA	418.3	7.2	21.35	1
31	VTAPFTDFLRAMN	HLA-DPA1*01:03/DPB1*02:01	13	APFTDFLRA	377	9.4	14.66	2
		HLA-DRB1*11:01	13	FTDFLRAMN	441.7	19	29.63	
32	VTAPFTDFLRAMN G	HLA-DRB1*11:01	14	FTDFLRAMN	155.6	13	14	3
		HLA-DRB1*01:01	14	TDFLRAMNG	344.4	52	55.99	
		HLA-DPA1*01:03/DPB1*02:01	14	APFTDFLRA	413.6	13	14	
33	VTAPFTDFLRAMN GG	HLA-DRB1*11:01	15	FTDFLRAMN	131.2	11	11	4
		HLA-DRB1*08:02	15	FTDFLRAMN	393.3	13	13	
		HLA-DRB1*01:01	15	TDFLRAMNG	426.6	52	52	
		HLA-DPA1*01:03/DPB1*02:01	15	APFTDFLRA	468	17	17	