

**Supplementary Table-1** : HLA types reported to present an epitope within the relevant peptides are listed according to <http://tools.iedb.org/population/>. HLA allele frequency within all Europe without any specific country or ethnicity is written in paranthesis.

European Coverage Class-I HLA

Epitope	Coverage	HLA allele (genotypic frequency (%))												Total HLA hits
	Class I	HLA-A*02:01 (28.14)	HLA-A*24:02 (9.42)	HLA-A*68:01 (3.34)	HLA-B*07:02 (11.91)	HLA-B*35:01 (5.65)	HLA-B*35:08 (0.48)	HLA-B*49:01 (1.36)	HLA-B*51:01 (5.21)	HLA-B*52:01 (1.33)	HLA-C*03:03 (4.75)	HLA-C*03:04 (6.01)	HLA-C*12:02 (1.32)	
Peptide-1 SRLLFYLAMPFATPMEAEARRSLAQ	64.49%	-	+	+	+	+	+	-	+	+	+	+	+	10
Peptide-2: PVPGVLLKEFTVSGNILTIRLTAADHR	8.77%	-	-	+	-	-	-	+	-	-	-	-	-	2
Peptide-3: SLLMWITQC	47.00%	+	-	-	-	-	-	-	-	-	-	-	-	1
Epitope set	83.68%	1	1	2	1	1	1	1	1	1	1	1	1	13

European Coverage Class-II HLA

Epitope	Coverage	HLA allele (genotypic frequency (%))									Total HLA hits
	Class II	HLA-DPB1*04:01 (38.47)	HLA-DPB1*04:02 (10.89)	HLA-DQB1*04:01 (1.05)	HLA-DRB1*01:01 (8.22)	HLA-DRB1*04:01 (6.20)	HLA-DRB1*07:01 (13.08)	HLA-DRB1*09:01 (1.27)	HLA-DRB1*11:01 (6.78)	HLA-DRB1*16:01 (4.12)	
Peptide -1: SRLLFYLAMPFATPMEAEARRSLAQ	84.45%	+	+	+	+	+	+	+	-	-	7
Peptide-2: PVPGVLLKEFTVSGNILTIRLTAADHR	42.78%	-	-	-	+	+	-	-	+	+	4
Peptide-3: SLLMWITQC	69.64%	-	-	-	-	-	-	-	-	-	2
Epitope set	88.63%	1	1	1	2	2	1	1	1	1	11

- : not restricted

**Supplementary Table-2: A)**TCRs coded by mRNA's used in in vitro stimulation assays. Known recognizing minimal peptides, and binding HLA types. **B)** Physical characteristics of each peptide.

A)

TCR name	Specific peptide	position	HLA type
CD8-pST1-hTCR-NYE#12	ATPMEAEARRSLAQ	97-111	B*0702
CD4-pST1-hTCR-NYE#3	PVPGVLLKEFTVSGNILTIRLT	117-139	DRB1*0401
CD8-pST1-NY-ESO 1-A2-TCR-VhuCmu	SLLMWITQC	157-165	A*0201

B)

Name	Position	Sequence	Hydropathy Top is hydrophilic Bottom is hydrophobic	Iso-electric point
				solubility
Peptide 1	85-111 (27mer)	SRLLFYLAMPFATPMEAEARRSLAQ		pH 6.82
				≤5mg/ml in H <sub>2</sub> O ≤10mg/ml in DMSO
Peptide 2	117-143 (27mer)	PVPGVLLKEFTVSGNILTIRLTAADHR		pH 10.52
				≤10mg/ml in H <sub>2</sub> O ≤5mg/ml in DMSO
Peptide 3	157-165 (9mer)	SLLMWITQC		pH 3.00
				Undissolved in H <sub>2</sub> O ≤10mg/ml in DMSO

Color codes:

Acidic

Aromatic

Basic

Aliphatic

Polar

Cysteine

**Supplementary Table-3: A) Nanoparticles containing single peptides. B) Nanoparticles containing three peptide mix.** Peptides used in production, peptide content after production and washing, and size characteristics of each nanoparticle batch are mentioned in different rows.

A)

Encapsulation of single peptides by PLGA				
Peptide	ug peptide used per mg PLGA	Peptide content of nanoparticle (ug pep/mg NP)	Particle Size $\pm$ SD	IMM60
Peptide 1	5	4.2	177 $\pm$ 50	+
	5	1.3	211 $\pm$ 70	+
	10	3.1	178 $\pm$ 47	+
	15	4.6	215 $\pm$ 66	+
	22.5	12.8	213 $\pm$ 51	+
	22.5	12.4	208 $\pm$ 49	-
Peptide 2	5	1	184 $\pm$ 54	+
	10	9.7	203 $\pm$ 53	+
	20	22.4	224 $\pm$ 71	+
Peptide 3	5	5.8	198 $\pm$ 52	+
	10	7.1	201 $\pm$ 55	+
	20	11.3	218 $\pm$ 59	+

B)

Encapsulation of multiple peptides by PLGA					
ug each peptide used per mg PLGA	Peptide content of nanoparticle (ug pep/mg NP)			Particle Size	IMM60
	Peptide 1	Peptide 2	Peptide 3		
5	6.5	4.3	6.8	189 $\pm$ 54	+
5	7.1	4	4	203 $\pm$ 58	+
10	8.2	7.2	8.3	211 $\pm$ 66	+
10	7.7	6.4	9.5	212 $\pm$ 73	+
10	7.2	6.2	9.3	219 $\pm$ 60	+
10	11.4	13.4	11.5	227 $\pm$ 61	+
10	7.6	7.1	7.6		
10	6.2	5.5	7.5		
10	8.8	5.9	12	199 $\pm$ 51	+
10	6.1	4.3	11	201 $\pm$ 53	-

**Supplementary Table-4:A)** Known B35 binding epitope (underlined) within the peptide-1 and DRB1\*0401 epitope (underlined) within peptide-2 shown with other overlapping peptides used in figure-3. **B)** HLA genotyping results of patients #6 and #7 in figure-3

A)

Peptide sequence	Position	Name
SRLLFY <u>LAMPFATPME</u> AELARRSLAQ	85-111	Peptide-1
SRLLFY <u>LAMPFATPME</u> A	85-102	
EFY <u>LAMPFATPME</u> AE	89-103	
<u>AMPFATPME</u> AELARR	93-107	
<u>ATPME</u> AELARRSLAQ	97-111	
PVPGV <u>LLKEFTVSGN</u> ILTIRLTAADHR	117-143	Peptide-2
<u>VLLKEFTVSGN</u> ILTIRLT	121-138	

B)

Patient 06	HLA Type - Class I	A3	A1	<b>B35</b>	B8	Cw4	Cw7
	HLA Type – Class II	<b>DRB1*01</b>	DRB1*03	DRB3*01	DQB1*02	DQB1*05	

Patient 07	HLA Type - Class I	A1	A2	B8	B27	Cw2	Cw7
	HLA Type – Class II	DRB1*0301/11	<b>DRB1*0401/</b> 13/16/21/26/ 33/35/38	DRB3*01	DRB4*01	DQB1*0201	DQB1*0302



**Supplementary Table-6:** PLGA NY-ESO-1 nanoparticle related microscopic findings in liver and lung –Scheduled Euthanasia Animals (Day 7).

Group	Males			Females		
	1	2	5	1	2	5
<b>Dose (mg/kg)</b>	<b>0</b>	<b>50</b>	<b>50</b>	<b>0</b>	<b>50</b>	<b>50</b>
<b>No. animals examined</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>
<b>Liver (No. Examined)</b>	(5)	(5)	(5)	(5)	(5)	(5)
Apoptosis/necrosis; hepatocellular	0	2	3	0	1	0
Minimal	0	2	2	0	1	0
Mild	0	0	1	0	0	0
Infiltration, mononuclear cell; vascular/perivascular	0	0	5	0	0	5
Minimal	0	0	5	0	0	2
Mild	0	0	0	0	0	3
Granulomatous inflammation	0	0	1	0	0	0
Minimal	0	0	0	0	0	0
Mild	0	0	1	0	0	0
Thrombus, minimal	0	0	1	0	0	0
<b>Lung (No. Examined)</b>	(5)	(5)	(5)	(5)	(5)	(5)
Infiltration, mononuclear cell; vascular/perivascular	0	0	1	0	0	2
Minimal	0	0	1	0	0	2
Mild	0	0	0	0	0	0