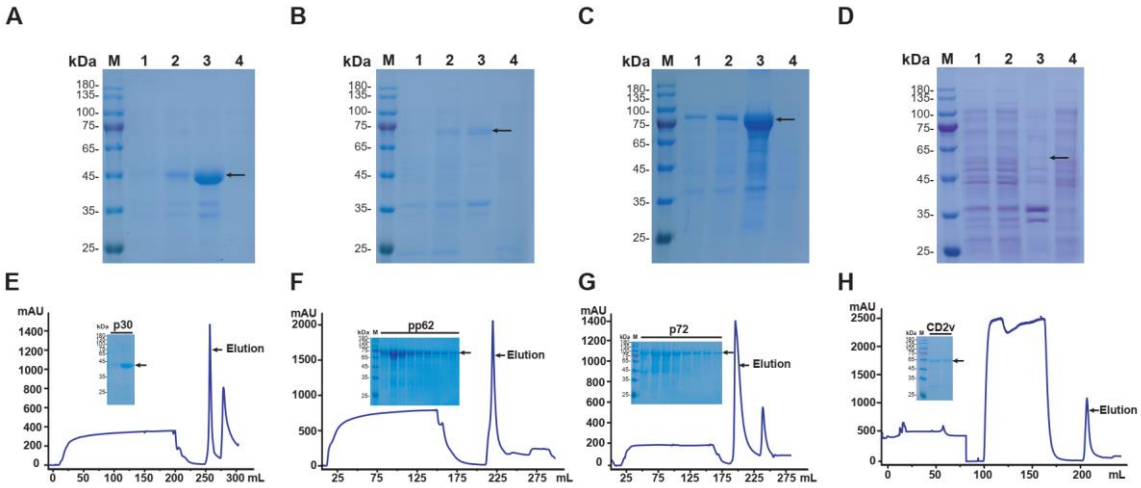

Figure S1. The expression and purification of ASFV proteins in *E. coli* BL21 was detected by SDS-PAGE. Related to Figure 1. SDS-PAGE data showing the expression of p30 (**A**), pp62 (**B**), p72 (**C**), and CD2v (**D**), respectively. ASFV proteins p30 (**E**), pp62 (**F**), p72 (**G**), and CD2v (**H**) expressed as inclusion bodies were purified by Ni-affinity chromatography by AKT protein purification system. M, Marker; 1, Before induction; 2, After induction; 3, Inclusion body; 4, Supernatant; Black arrow shows the location of the target protein.

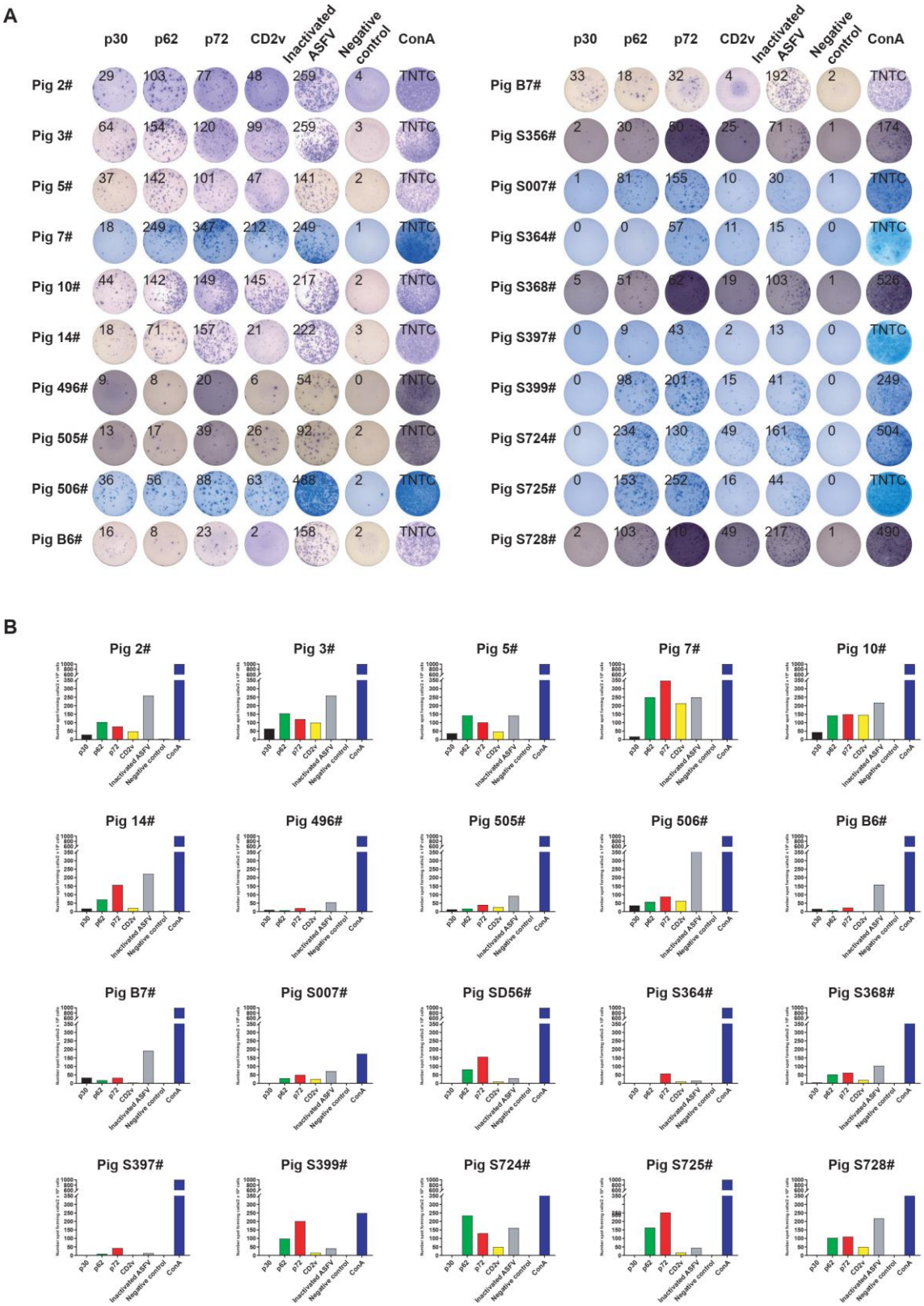

Figure S2. The ELISPOT assays of protein-specific T cells. Related to Figure 1. (**A**) The ELISPOT data showed immune spots formed by IFN-γ secretion after PBMC stimulation in surviving pigs. PBMCs (2×10^5/well) were stimulated with ASFV proteins at a final concentration of 10 μg/mL. ConA was applied as a positive stimulus. The ELSPOT data were captured by an automatic ELISPOT reader, and the number of spots was analyzed by ImmunoCapture 6.5.0 software. (**B**) Statistical analysis of the proportion of spots per surviving pig.

Positon	P334	SLA-1*0101 Interacting Residues	P351	SLA-3*0301 Interacting Residues	P366	SAL-1*1201 Interacting Residues
P1	S	GLU-166	S	TYR-7; TYR-59; GLU-63	S	GLU-170; GLU-63
P2	L	/	R	ASN-66	S	GLU-63; LYS-66
P3	D	TYR-59; TYR-159; TYR-7	I	TYR-159	Y	GLU-152
P4	E	/	S	TYR-159	I	/
P5	Y	GLU-63; GLN-67	N	SER-24	P	/
P6	S	/	I	TYR-99	F	/
P7	S	/	K	GLU-62	H	/
P8	D	/	N	GLN-155	Y	/
P9	V	/	V	/	G	GLU-152
P10	T	ARG-155	N	GLN-155; TRP-156	G	THR-80
P11	T	/	K	TRP-147	N	/
P12	L	ASN-80; TYR-84	S	/	A	LYS-146
P13	/	/	Y	ASN-77; ASN-80; TYR-84; ASP-116; TYR-118	I	/
P14	/	/	/	/	K	ASN-86

Figure S3. Each amino acid of the epitopes P334, P352, and P366 interact with amino acid in the SLA-I allele pocket. Related to Figure 3.

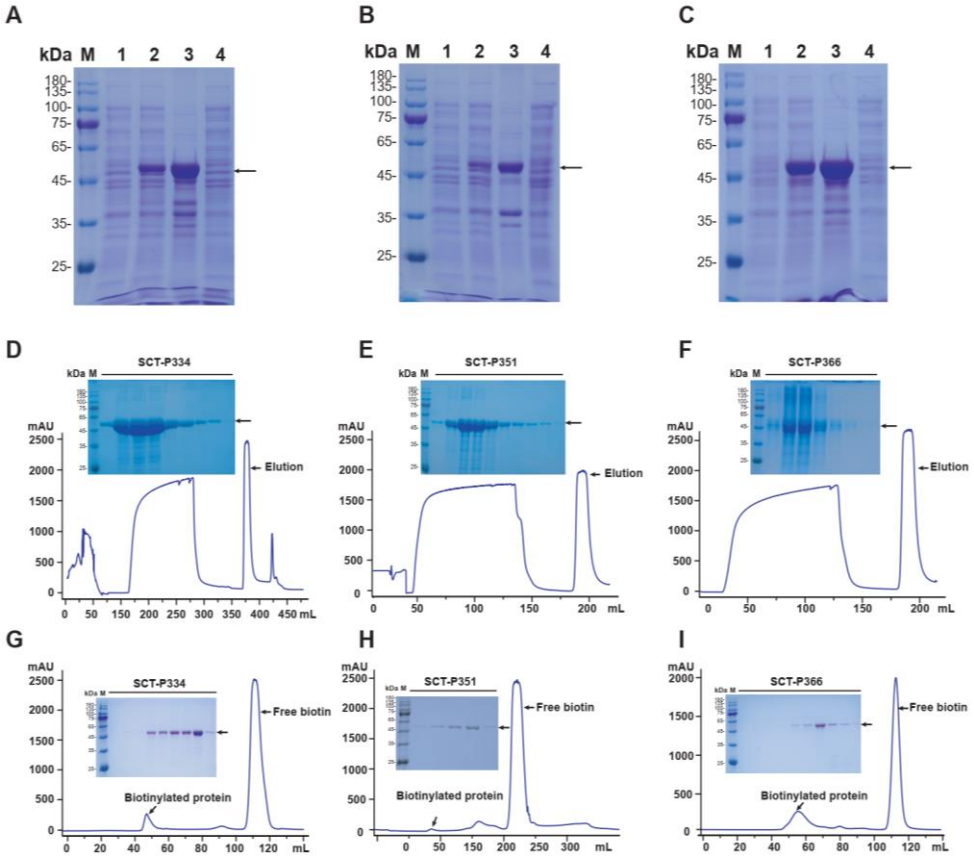

Figure S4. The expression and purification of tetramer protein was detected by SDS-PAGE. Related to Figure 3. (**A**, **B**, **C**) Tetra-334, Tetra-351, and Tetra-366, respectively. (**D**, **E**, **F**) SCT inclusion bodies were purified by Ni-affinity chromatography. (**G**, **H**, **I**) Biotinylation of SCT was purified by the AKT protein purification sys-tem using size exclusion chromatography. M, Marker; 1, Before induction; 2, After induction; 3, Inclusion body; 4, Supernatant; Black arrow shows the location of the target protein.

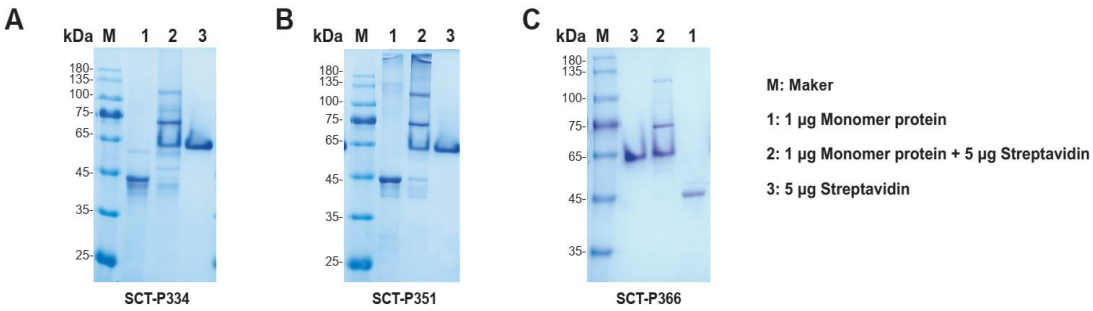

Figure S5. The biotinylation efficiency of the SLA-I-peptide complex was evaluated by SDS-PAGE gel-shift assays. Related to Figure 3.

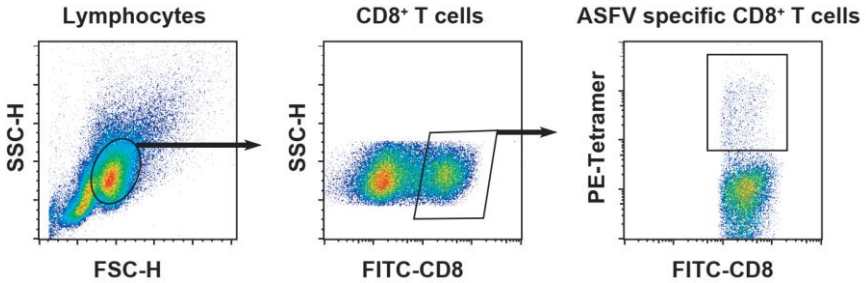

Figure S6. Gating strategy for PBMCs staining flow cytometry. Related to Figure 5.

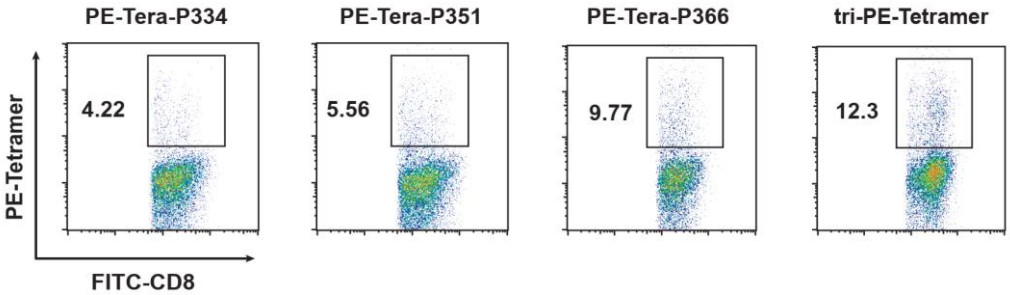

Figure S7. The proportion of CD8+ specific T cells of surviving Pig 10# was measured by flow cytometry assays of PBMCs stained with PE-Tera-P334, PE-Tera-P351, PE-Tera-P366 and tir-PE-Tetramer. Related to Figure 5.

Table S1. The general information of the surviving pigs.

No.	Pig number	Days of age	Sampling time	Storage condition	
				PBMCs	Serum
1	**Pig 2#**	**50-day-old**	60 dpi*	LN_2*	-80°C
2	Pig 3#	50-day-old	58 dpi	LN_2	-80°C
3	Pig 5#	50-day-old	63 dpi	LN_2	-80°C
4	Pig 7#	50-day-old	60 dpi	LN_2	-80°C
5	Pig 10#	50-day-old	62 dpi	LN_2	-80°C
6	Pig 14#	50-day-old	65 dpi	LN_2	-80°C
7	Pig 496#	50-day-old	48 dpi	LN_2	-80°C
8	Pig 505#	50-day-old	43 dpi	LN_2	-80°C
9	Pig 506#	50-day-old	50 dpi	LN_2	-80°C
10	Pig B6#	50-day-old	40 dpi	LN_2	-80°C
11	Pig B7#	50-day-old	55 dpi	LN_2	-80°C
12	Pig S007#	50-day-old	55 dpi	LN_2	-80°C
13	Pig S356#	50-day-old	51 dpi	LN_2	-80°C
14	Pig S364#	50-day-old	48 dpi	LN_2	-80°C
15	Pig S368#	50-day-old	48 dpi	LN_2	-80°C
16	Pig S397#	50-day-old	41 dpi	LN_2	-80°C
17	Pig S399#	50-day-old	58 dpi	LN_2	-80°C
18	Pig S724#	50-day-old	66 dpi	LN_2	-80°C
19	Pig S725#	50-day-old	66 dpi	LN_2	-80°C
20	Pig S728#	50-day-old	66 dpi	LN_2	-80°C

* days post infection (dpi); liquid nitrogen (LN_2)