

Figure S1. Verification of Inactivated antigen, JC-VP1 and PA2-VP1.

(A, B) Spectrophotometer analysis of inactivated antigen, JC-VP1(A) or PA2-VP1(B) in 15%–45% sucrose gradient
 (C, D) Transmission electron microscopy of inactivated antigens, JC-VP1(C) or PA2-VP1(D). The bar represents 100nm.
 (E, F) Confirmation of inactivated FMDV antigen, JC-VP1(E) or PA2-VP1(F) dilution using lateral flow assay (PBM co. ltd) kit

Table S1. Comparison of critical antigenic residues in structural proteins for FMDV type O.

Strains	Site 1 (VP1)				Site 2 (VP2)												Site 3 (VP1)		Site 4 (VP3)										Site 5 (VP1)	
	144	148	150	208	700	701	702	703	704	705	707	708	1029	1031	1038	1039	1090	1091	403	404	506	508	605	608	1016	1031	1033	1091	1095	149
O Manisa	V	L	V	P	V	T	S	D	P	F	R	C	L	S	V	N	S	T	P	H	E	T	T	D	E	K	D	G	Q	
O PA2-VP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O JC-VP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	
O JC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	D	-	-	-	-	-	E	-	-	
O TWN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-	D	-	-	-	-	-	-	-	-	
O PA2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	-	-	-	-	-	-	-	R	-	-	

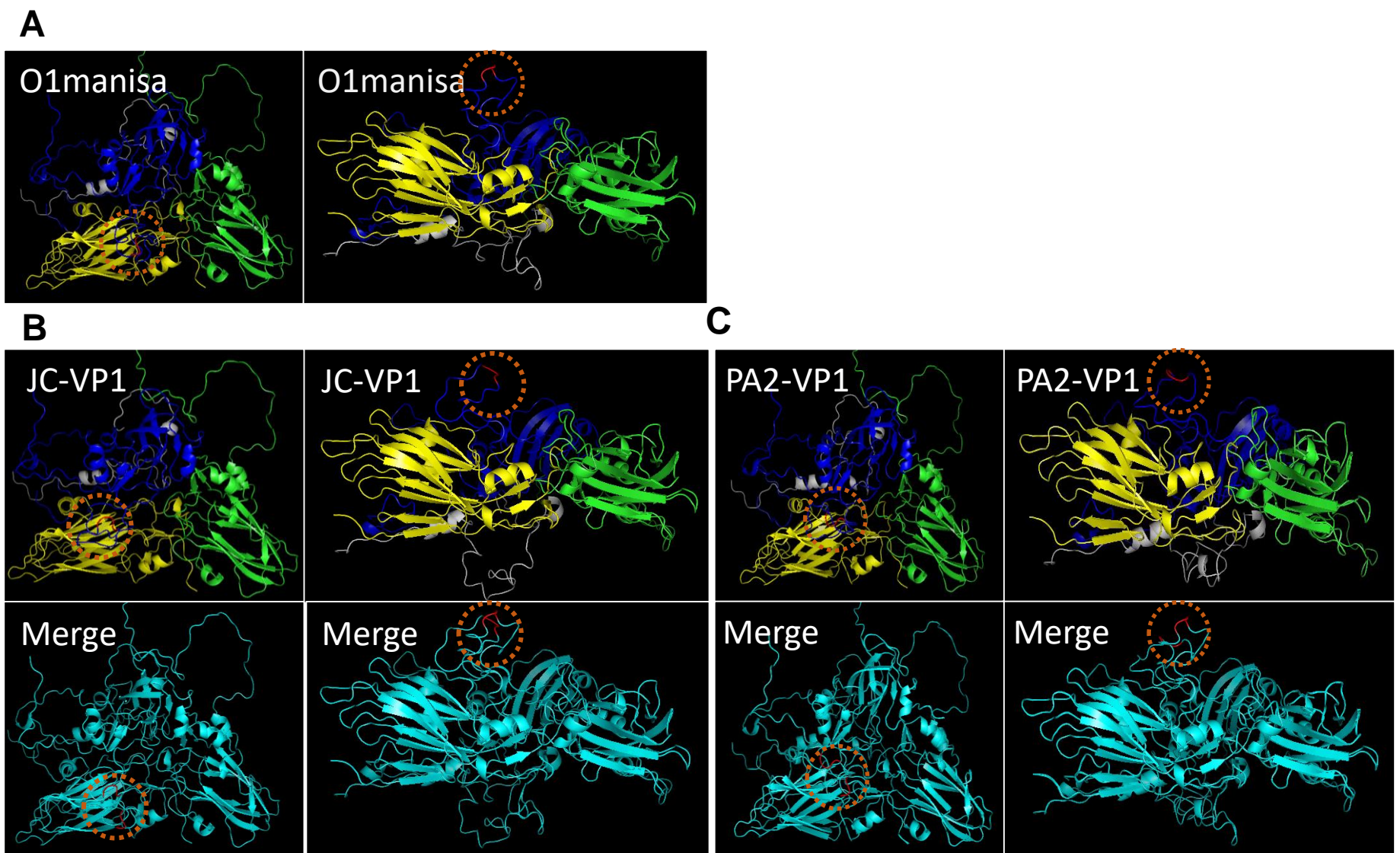


Figure S2. Schematic diagram of FMDV genomes with VP1 epitope addition for broad spectrum vaccine strains for type O.

- (A) Surface structure of O1 manisa virus as a control
- (B) Surface structure of JC-VP1
- (C) Surface structure of PA2-VP1

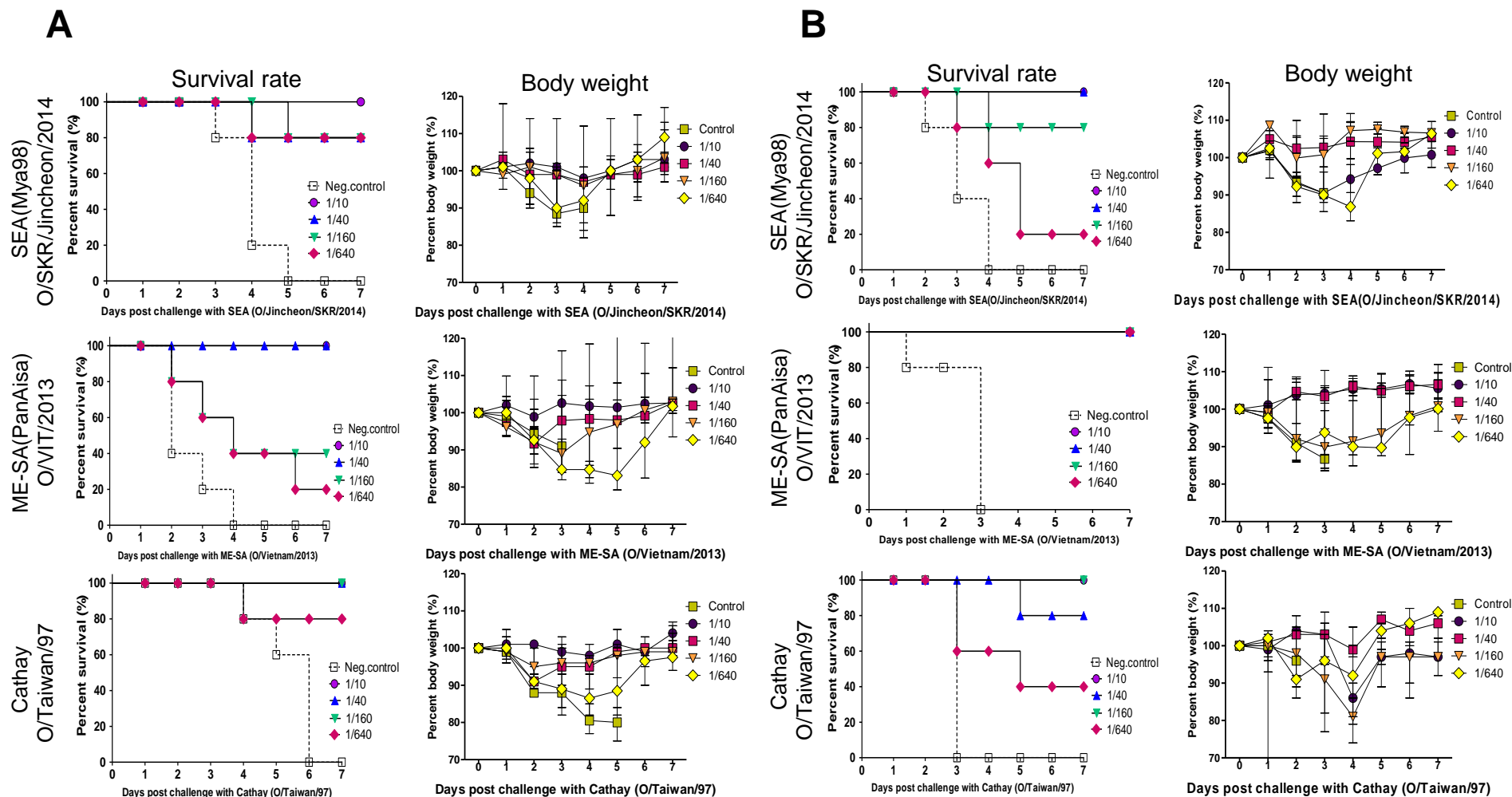
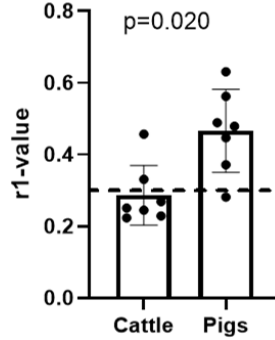
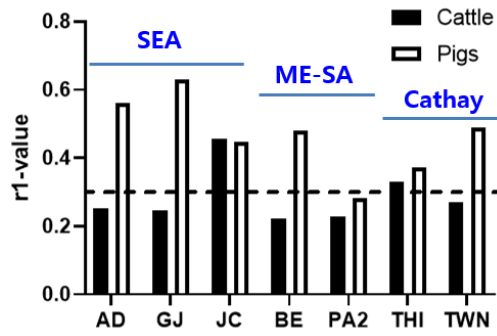


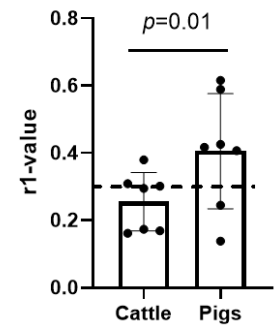
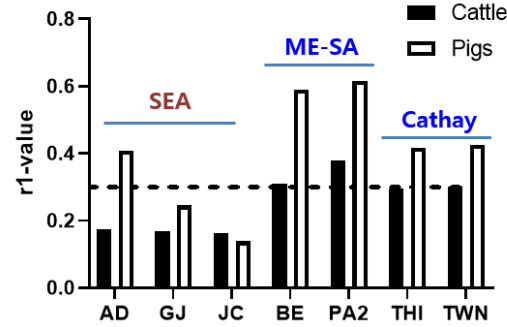
Figure S3. Protection of the vaccinated mice challenged with typical three topotypes of FMDV.

C57BL/6 female mice were vaccinated with 1/10(1.5 μ g), 1/40, 1/160, 1/640 dose of JC-VP1 (A) or PA2-VP1 (B) used for this experiment. The challenged viruses belong to topotype of ME-SA, SEA, and Cathay topotypes.

A



B



C

Sera from vaccinated animals Topotype, strain		Cattle		Pigs	
		PA2-VP1	JC-VP1	PA2-VP1	JC-VP1
SEA	AD/2010	0.174	0.251	0.407	0.562
	GJ/2016	0.169	0.245	0.245	0.631
	JC/2014	0.162	0.457	0.138	0.447
ME-SA	BE/2017	0.309	0.224	0.589	0.479
	PA2/2008	0.380	0.229	0.616	0.282
Cathay	THI/1960	0.295	0.331	0.417	0.372
	TWN/1997	0.302	0.269	0.426	0.489

Figure S4. R1 value of JC-VP1 and PA2-VP1 in cattle and pigs.

(A) r1 value of JC-VP1 in cattle and pigs

(B) r1 value of PA2-VP1 in cattle and pigs

(C) Comparison of r1 value between JC-VP1 and PA2-VP1.

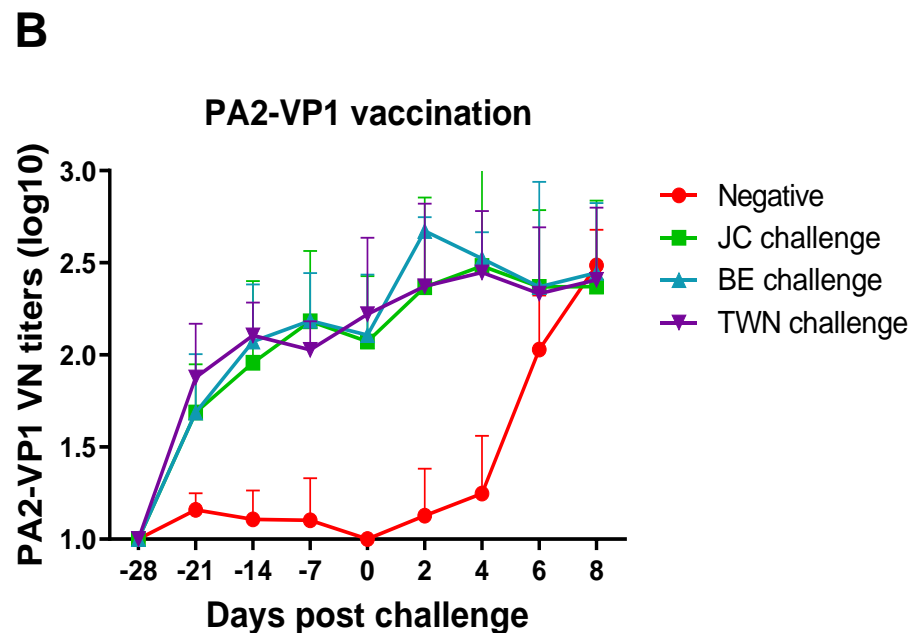
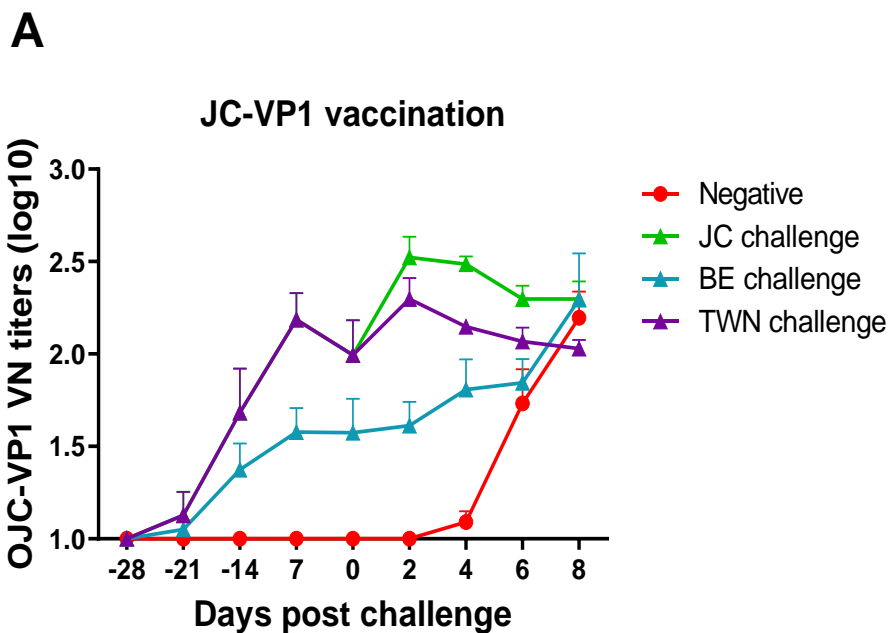


Figure S5. Variation of virus neutralizing titers against vaccine strain after each three topotype challenge in pigs vaccinated with JC-VP1 and PA2-VP1.

(A) Virus neutralizing titers against JC-VP1

(B) Virus neutralizing titers against PA2-VP1