



Understanding for the NSP incidence of pig farms in Korea

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Contents

- 1 Recent FMD situation in Korea
- 2 FMD surveillance and control measures in Korea
- 3 NSP positive farm analysis
- 4 Pilot studies for interpretation of NSP reactions

1. Recent FMD situation in Korea

FMD situation and **vaccination policy** in Korea (2000-2017)

❖ 2000 ~ 2017 FMD outbreaks (9 outbreaks)

- 1st : Mar 2000(O/PanAsia), 15 Cattle farms, [Ring Vaccination](#)
- 2nd : May 2002(O/PanAsia), 15 Pig & 1 Cattle farms, No Vac.
- 3rd : Jan 2010(A/Sea-97), 6 Cattle & 1 Deer(Ab) farms, No Vac.
- 4th : April 2010(O/Mya-98), 8 Cattle & 5 Pig farms, No Vac.
- 5th : Nov 2010(O/Mya-98), 153 cases(3,748 farms), No Vac.→[Vaccination \(2011-\)](#).
- 6th : July 2014 (O/Mya-98), 3 pig farms ([Nationwide Vaccination](#))
- 7th : Dec 2014 (O/Mya-98), 185 Cases ([Nationwide Vaccination](#))
- 8th : Jan 2016~ (O/Mya-98), 21 Cases~ ([Nationwide Vaccination](#))
- 9th and 10th: Feb 2017 (O/Ind2001d, A/sea-97), 9 Cases([Nationwide Vaccination](#))

Comparison of culled animals in 2010 Nov. Vs 2014 Dec.

(FMD huge outbreaks in Korea)

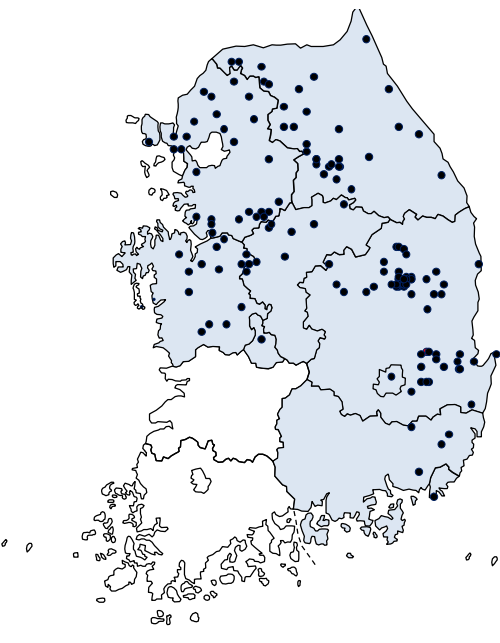
Two strategies

Non-Vac
(153 cases, Index farm)

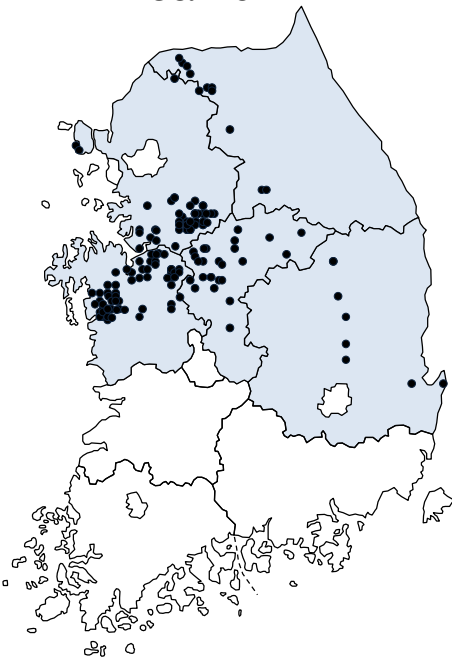
Nov 2010

Vaccination
(185 cases, infected farm)

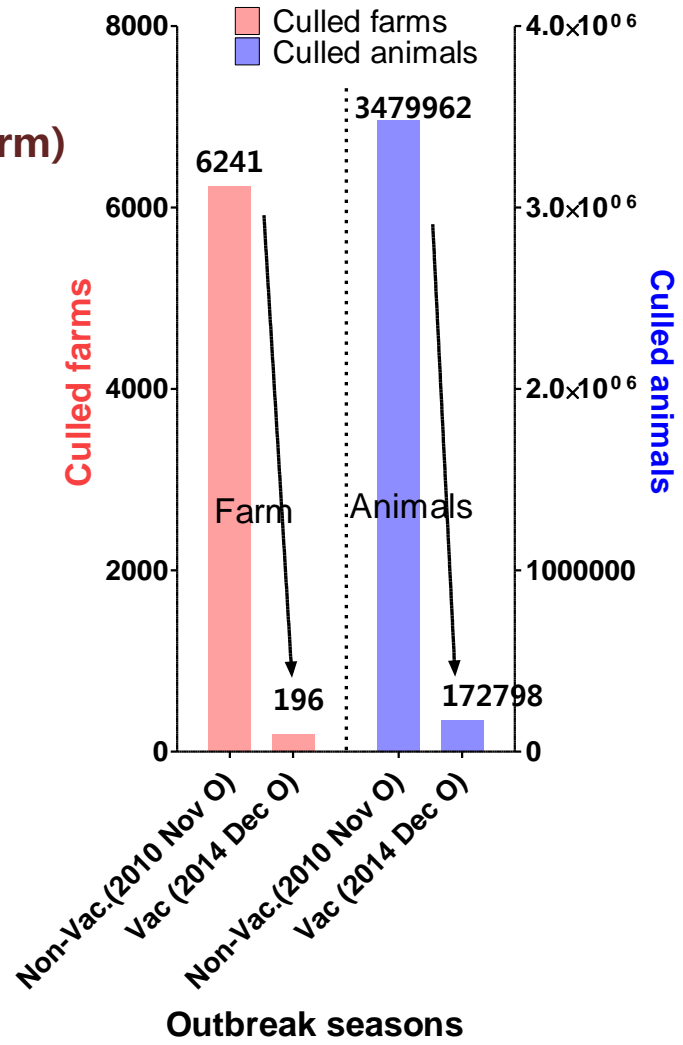
Dec. 2014



O/SEA

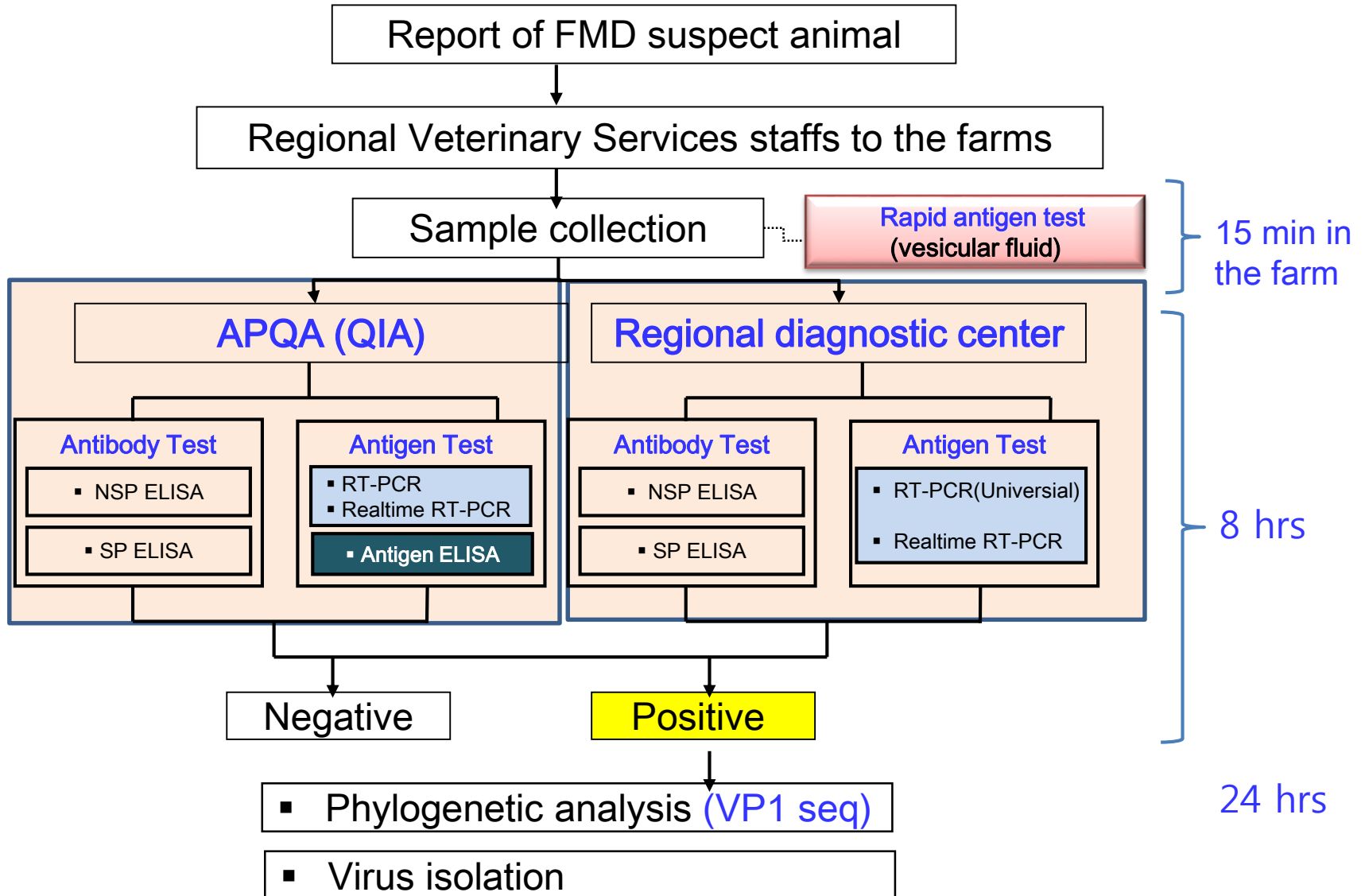


O/SEA



2. Serologic surveillance and Control Measures in Korea

Diagnosis procedures for FMD in Korea



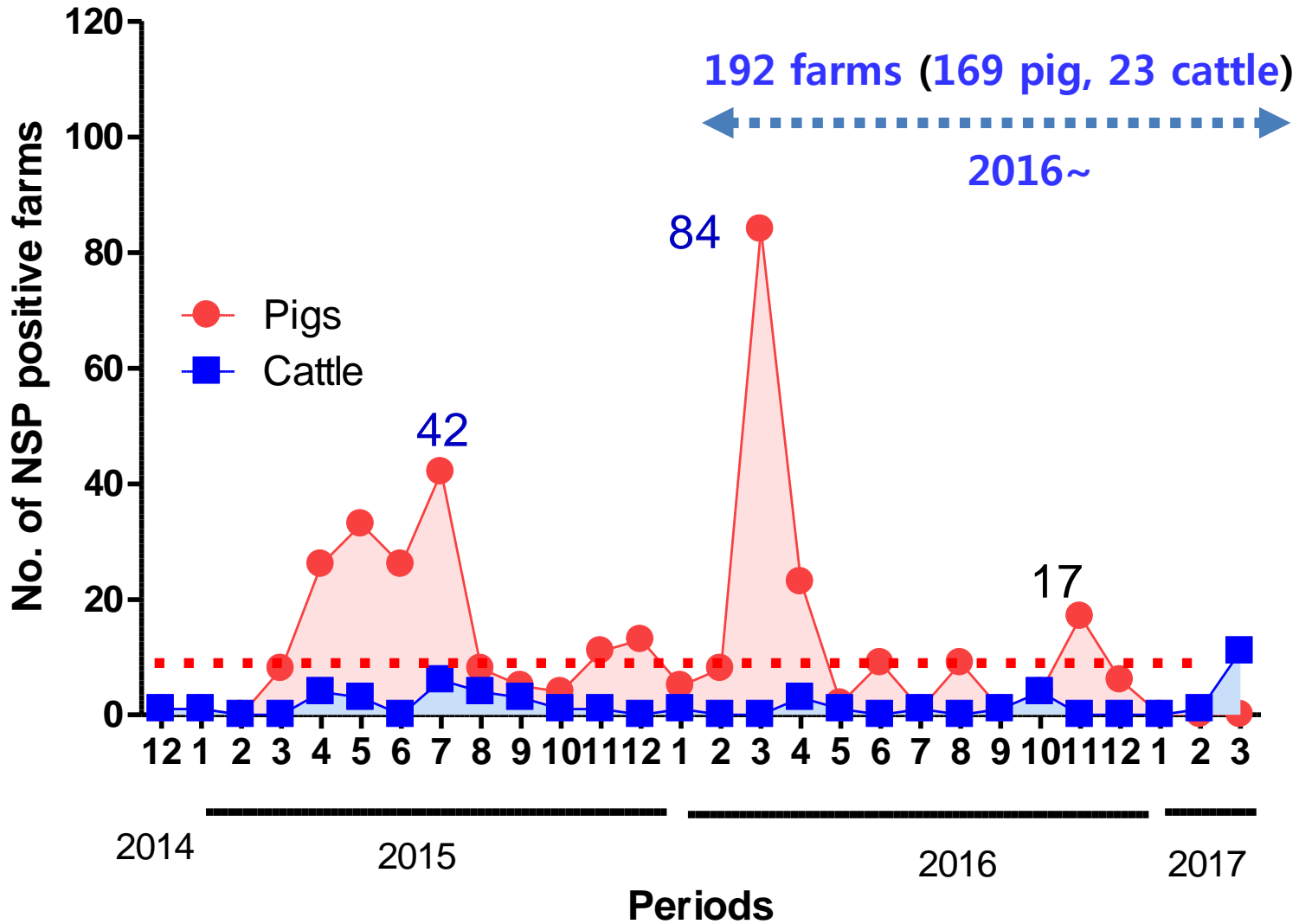
Serological surveillance in Korea

- **NSP antibody test for active surveillance**
 1. **Statistical surveillance using stratification criteria**
 - 1st; 1% morbidity, 95% diagnostic sensitivity, random
 - 2nd : 10% (goat 20%) morbidity, 95% confidence
 - cattle 5 head, goat 4 head random sampling
 - 18,182 heads in 2017
 2. **Purposive surveillance**
 - pig NSP, slaughterhouse, GGP farm, breeding stock farm, wild animal, NSP-chasing,
 - 256,038 test in 2017
- **SP antibody test for vaccine performance**
 - **cattle** (8-10% of all the cattle, 47,568 test),
 - **pigs** (2 times/farm/year, 235,303 test)

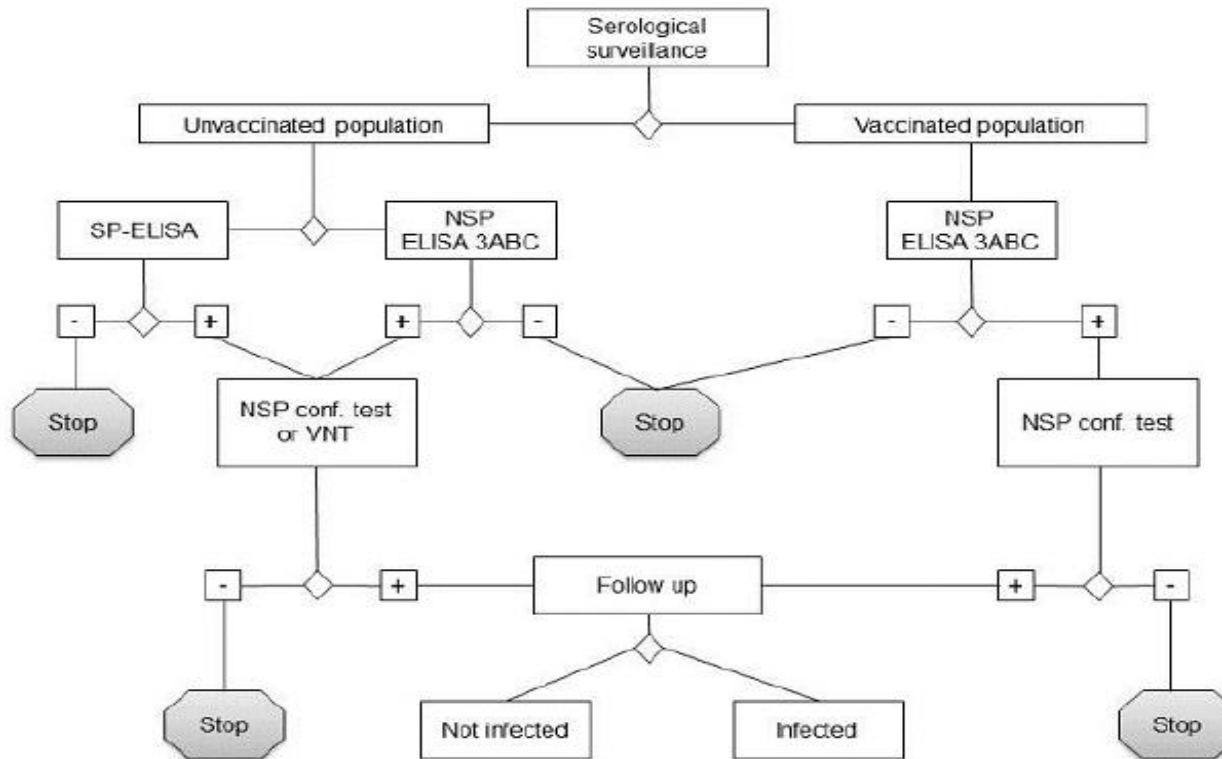
Tested numbers by serological surveillance

Year	Cattle		Pigs		Goat & others		Total	
	NSP	SP	NSP	SP	NSP	SP	NSP	SP
2011	81,903	15,498	12,533	65,816	3,399	3	109,934	81,317
2012	84,784	23,929	30,202	77,247	3,765	1,146	138,915	102,322
2013	47,471	20,738	15,976	84,704	3,423	1,965	84,185	107,407
2014	51,423	40,704	75,918	145,032	3,888	2,620	131,229	188,356
2015	51,543	35,692	197,930	260,870	4,062	1,892	253,535	298,454
2016	52,553	28,522	378,721	362,120	3,767	1,861	435,041	392,503

NSP positive farms

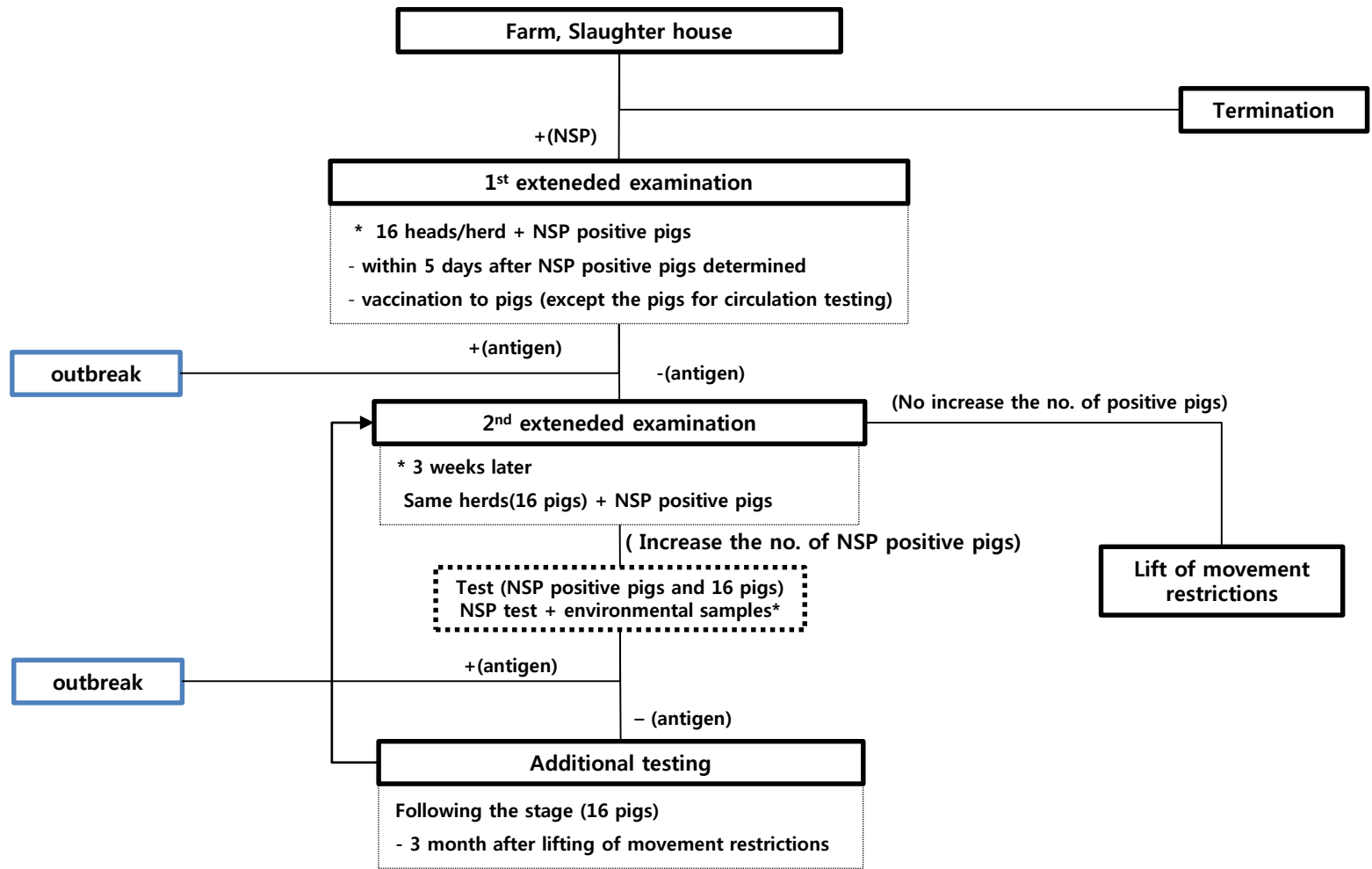


Schematic procedures for determining evidence of infection with FMDV via serologic surveys



OIE code (8.8.42)

Tests and Control measures in NSP positive farm by serologic surveys(Korea)



3. Analysis of NSP positive farms

NSP positive farms

(NSP positive with no clinical signs and antigen, from Jan., 2016. – Jun., 2017)

(‘15. 1.~’17. 6.)

Origin	No. of NSP positive farm	1st Extended exam	2nd Extended exam	3rd Extended exam	Antigen
Slaughterhouse	176	156	20(3)	0	-
Epidemiologically related outbreak farms	10	10	0	0	-
GP farm	26	21	5(2)	0	-
National surveillance	7	3	4(0)	0	-
Hong-sung area (Historically outbreak area)	110	89	21(17)	(3)*	-
Total	318	318	66	0	-

80%

() : increase the no. of NSP positive pigs in 2nd extended examination

* : 3 farm(to 4th, 6th, and 4th respectively)

Slaughterhouse

No.	Farm	Result (< 0.6)	Positive/tested(Date)	Extended Test(ET)	
				1st	2nd
1	A	0.74	6/10 (15.4.20)	0/16 (4.21)	0/16 (5.13)
		0.51			
		0.47			
		0.40			
		0.66			
		0.37			
		0.70			
		0.57			
		0.52			
		0.77			
2	B	0.76	7/10 (15.4.29)	0/16 (5.3)	0/16 (5.22)
		0.74			
		0.31			
		0.47			
		0.45			
		0.36			
		0.40			
		0.33			
		0.42			
		0.63			
0.39					
3	C	0.21	4/10 (15.6.1)	0/16 (6.2)	0/16 (6.25)
		0.74			
		0.63			
		0.13			
		0.79			
		0.90			
		0.67			
		0.43			
		0.41			
		0.65			
0.30					

No	Farm	Result (ELISA)	Positive/ Tested(Date)	1 st ET		2 nd ET	
				ELISA	Positive/ Tested(Date)	ELISA	Positive/ Tested(Date)
5	D	0.58	5/10 (4.29)	0.81	5/16 (4.30)	0.39	5/16 (5.21)
		0.49					
		0.76					
		0.52					
		0.73					
		0.67					
		0.86					
		0.56					
		0.85					
		0.81					
		0.67					
		0.83					
		0.63					
		0.42					
		0.73					
6	E	0.49	8/10 (7.9)	0.46	3/16 (7.10)	0.23	3/16 (8.4)
		0.40					
		0.47					
		0.6					
		0.66					
		0.72					
		0.52					
		0.44					
		0.72					
		0.73					
		0.74					
		0.33					
		0.65					
		0.73					
		0.68					
6	E	0.39	8/10 (7.9)	0.70	3/16 (7.10)	0.71	3/16 (8.4)
		0.33					
		0.68					
		0.86					
		0.47					
		0.86					
		0.90					
		0.60					
		0.50					
		0.37					
		0.59					
		0.26					
		0.74					
		0.79					
		0.76					
0.64							
0.61							
0.84							
0.90							
0.66							
0.66							
0.32							
0.19							
0.61							
0.61							
0.80							
0.50							
0.26							
0.75							
0.57							
0.64							
0.69							
0.80							
0.50							
0.57							
0.64							
0.69							
0.80							
0.50							

Targeted farms (Hong Sung)

Farm	ELISA (<0.6)	Positive/ tested(Date)	Extended exam	
			1st	2nd
A	1.02	1/16 (16.11.28)	0/47 (11.29)	0/16 (12.28)
	1.08			
	0.99			
	1.12			
	0.55			
	1.10			
	1.01			
	0.97			
	1.04			
	1.01			
	0.99			
	0.97			
	0.95			
	0.96			
0.97				
1.00				
B	0.93	3/16 (16.11.28)	0/47 (11.29)	0/16 1.10
	0.87			
	0.97			
	1.08			
	0.56			
	0.46			
	1.10			
	1.05			
	0.95			
	0.97			
	1.03			
	1.10			
	0.47			
	1.06			
1.03				
0.99				

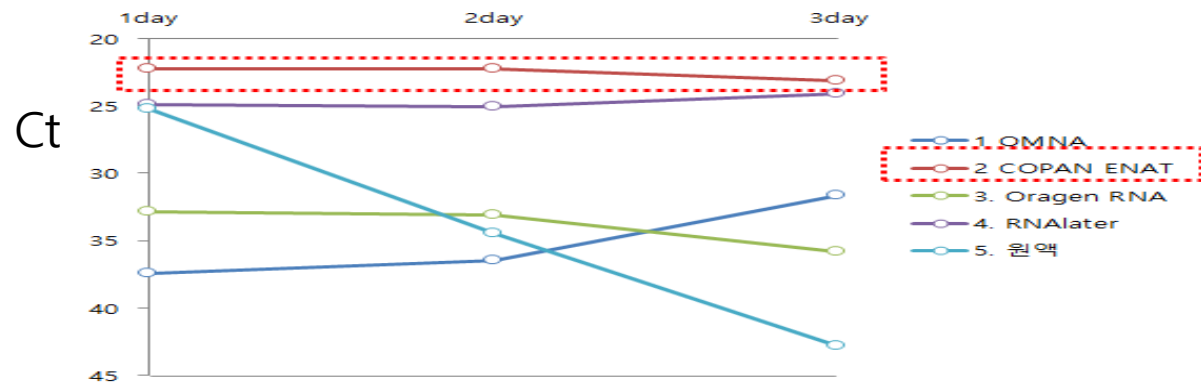
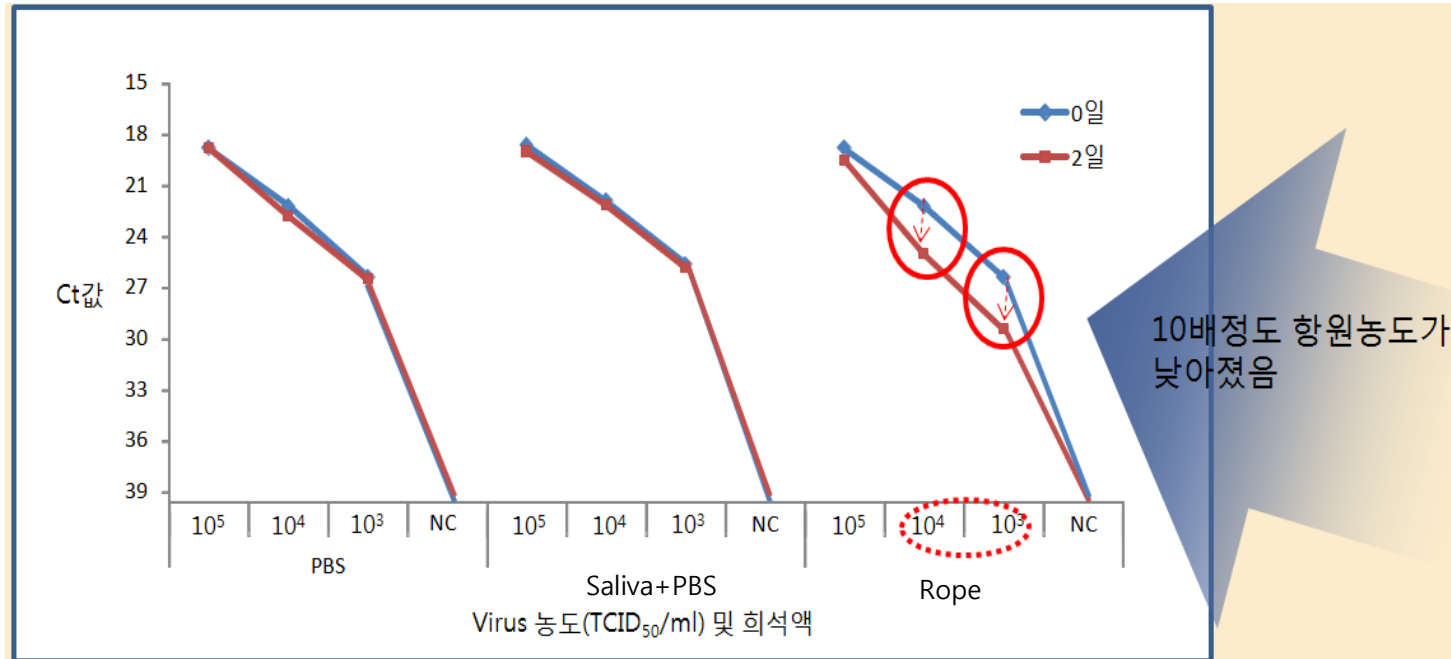
Farm	ELISA (<0.6)	Positive/ tested(Date)	1 st Extended exam		2 nd Extended exam	
			ELISA (<0.6)	Positive/ tested(Date)	ELISA (<0.6)	Positive/ tested(Date)
C	0.55	4/18 (15.3.29)	0.49	5/80 (3.31)	0.54	7/48 (4.21)
	0.56		0.40		0.36	
	0.47		0.35		0.58	
	0.51		0.30		0.44	
			0.40		0.4	
					0.43	
		0.54				

4. Pilot studies for interpretation of NSP reactions

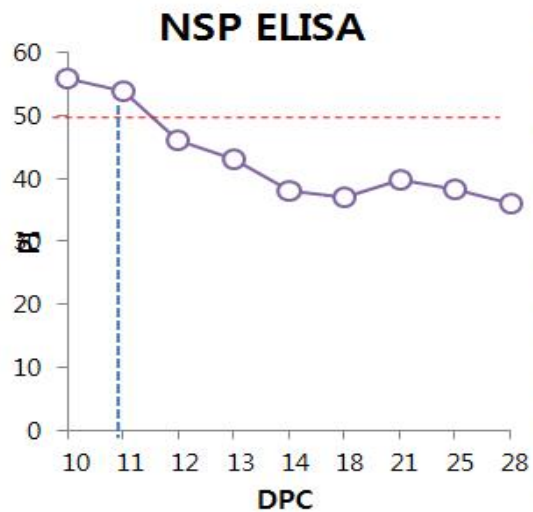
Why FMD antigen was not detected in NSP positive pigs ?

- Sample Transportation
- Degraded virus or NSP inducing materials ?

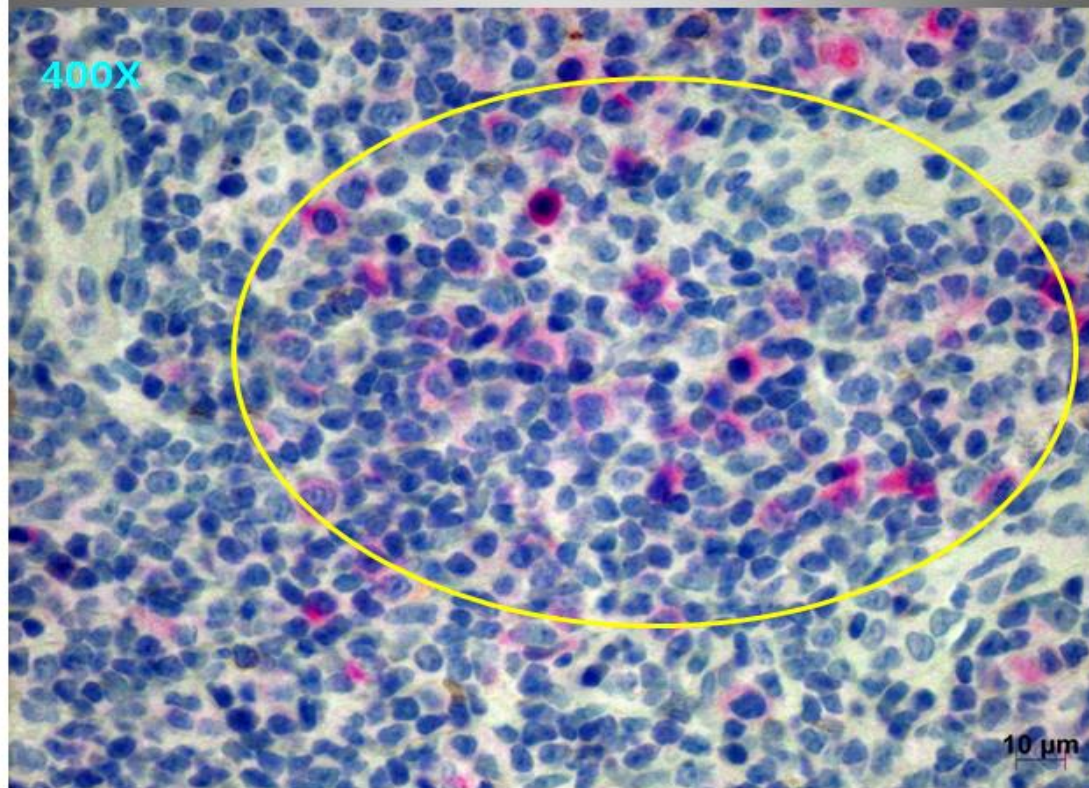
Sample transportation

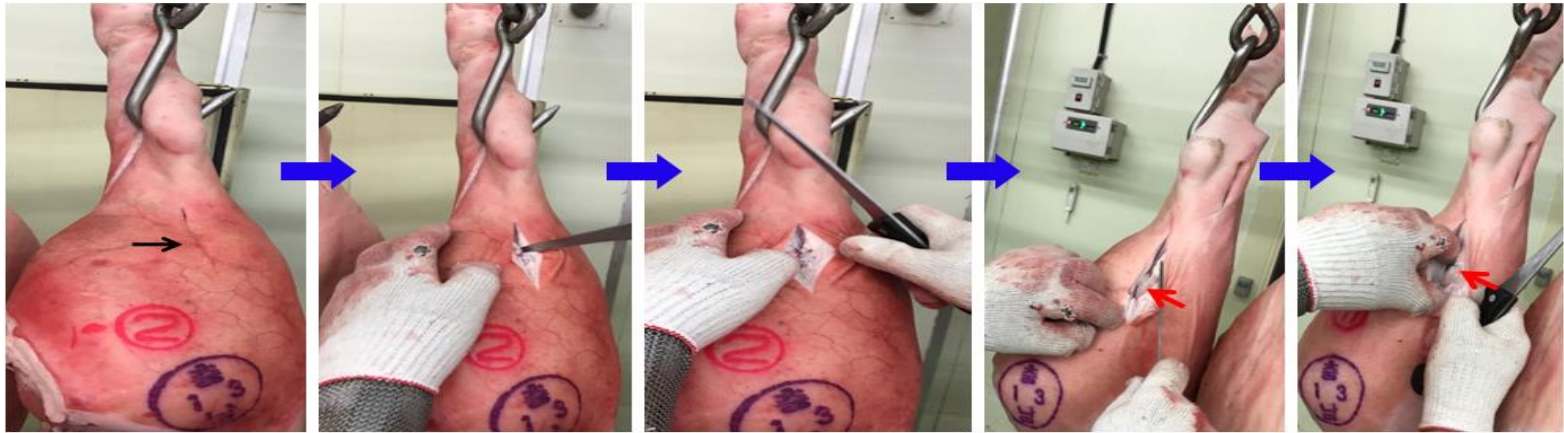


Degraded virus particle?



Donor : FMDV O/GJ/SKR/2016(No vaccine)
Autopsy: 35dpc (NSP Ab 11일째까지만 확인)

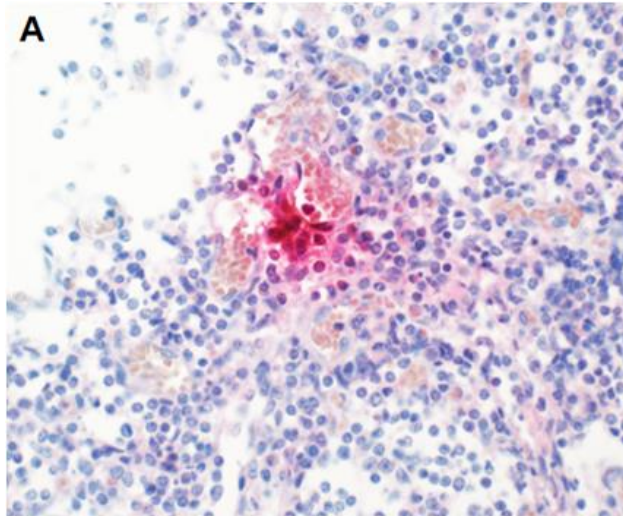




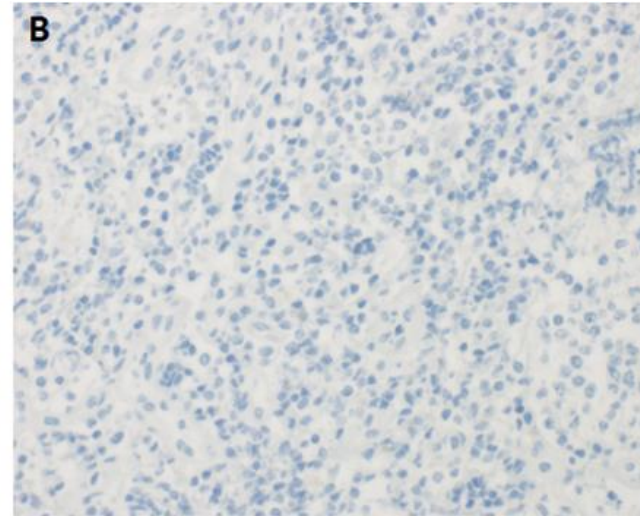
1번 : 뒷다리 혹 들어간
부분 13cm 정도
세로로 칼집

2번 : 개봉하자마자
Popliteal LN
확인 가능

3, 4, 5번 : 만져지는 Popliteal LN 꺼집어 냄



Challenged pig (LN)



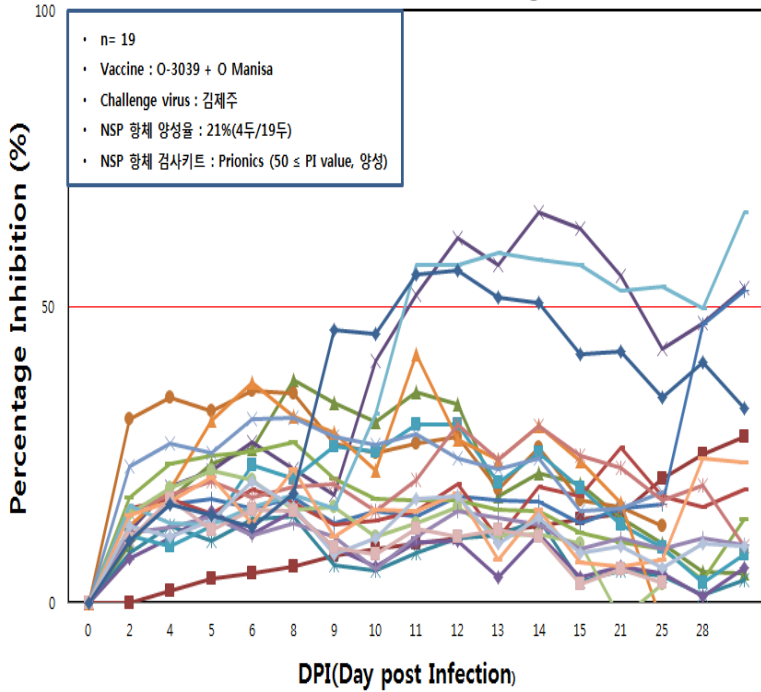
NSP positive-farm pig (LN)

Experimental inoculation of recombinant NSP (NSP antibody)

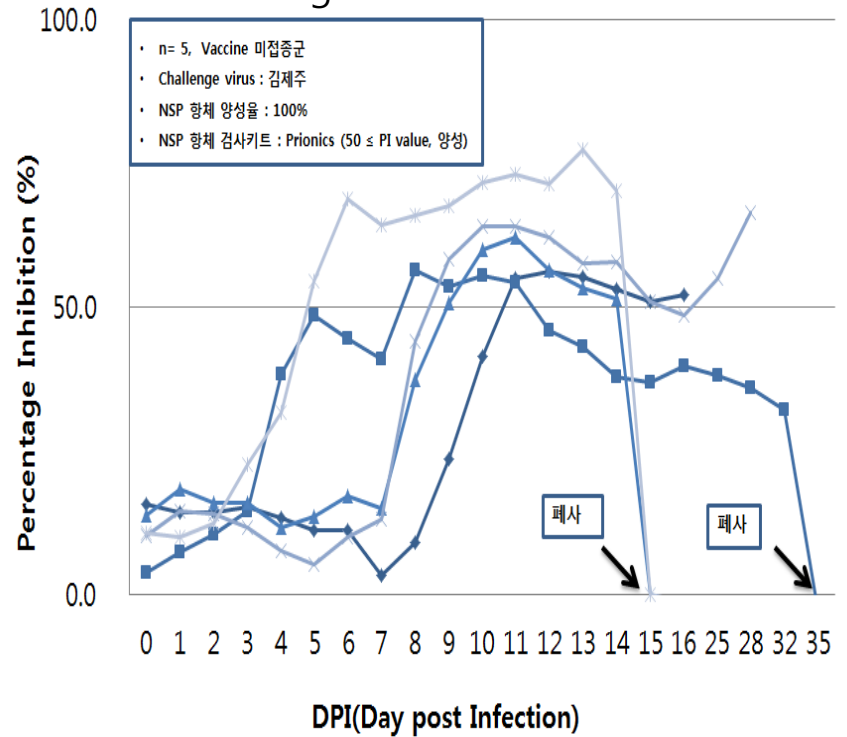
If the NSP antibody is positive, How long persist in the pigs?

NSP antibody persistence of the pigs inoculated by wild virus (O, Gimje strain)

<Vaccinated + challenge>

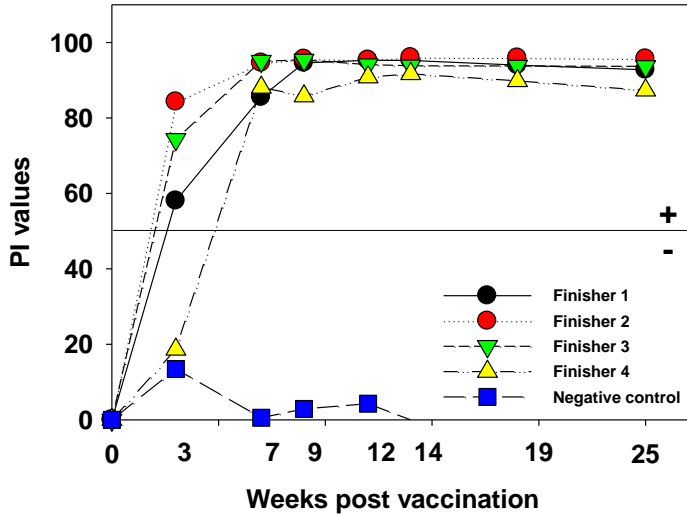
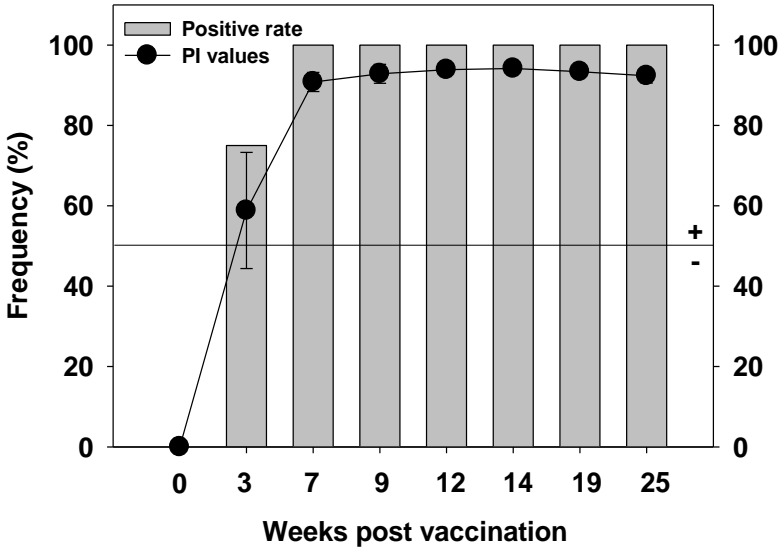


<Challenge>

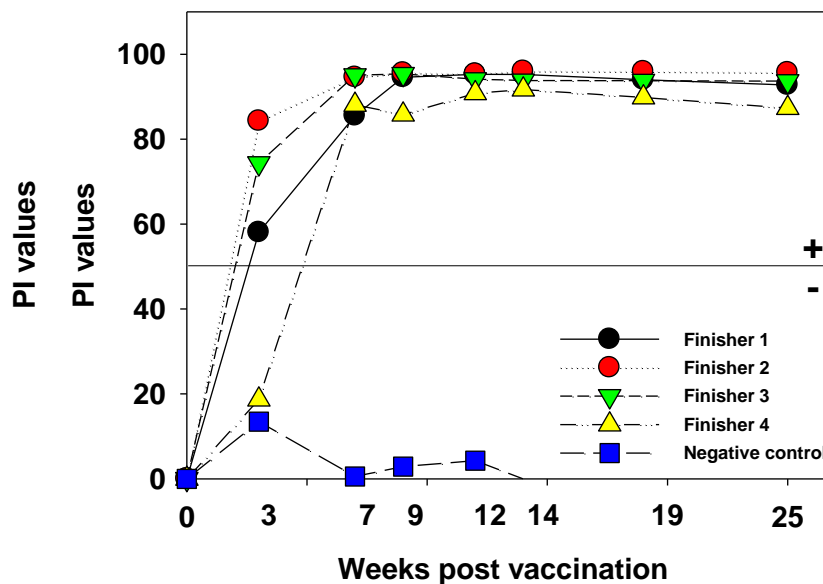
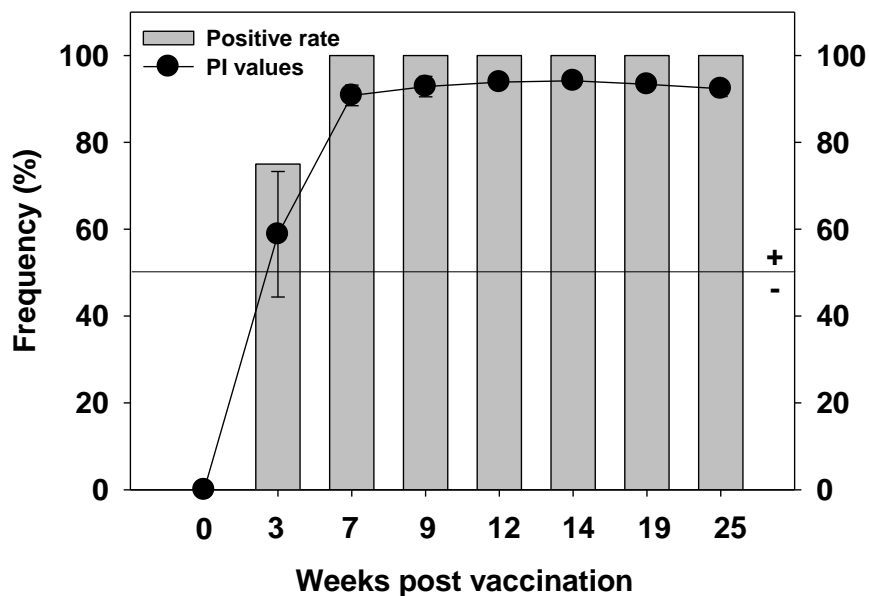
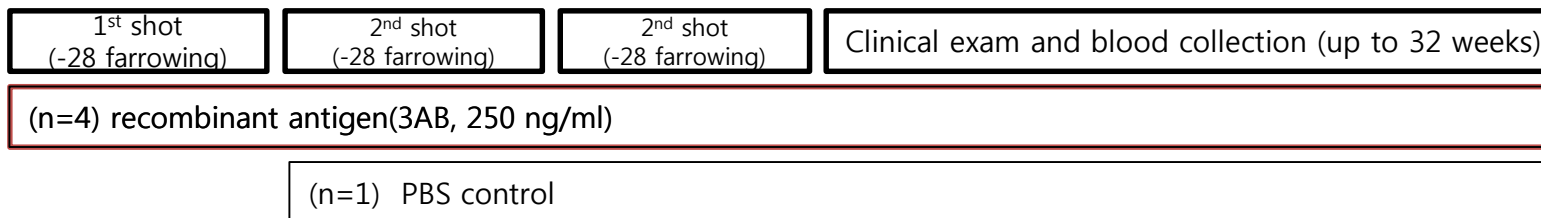


NSP antibody persistence of the finisher pigs inoculated with Recombinant NSP antigen

1 st shot	2 nd shot	Clinical exam and blood collection
(n=4) recombinant antigen(3AB, 250 ng/ml)		
(n=1) PBS control		



NSP antibody persistence of the breeder pigs inoculated with Recombinant NSP antigen



Conclusion

- NSP confirmation method (eg. EITB) need to differentiate the non-specific reactions
- NSP would be lasted for 25 weeks if the NSP is specific one
- Antigen detection of NSP positive farm could rely on transport materials

THANK YOU
FOR LISTENING

